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THE BOTANICAL GAZETTE

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In the March number will appear:

Flowers and insects. XIII, by CHARLES ROBERTSON, *Carlinville, Ills.*

Apparatus for physiological experiments, by PROF. W. C. STEVENS, *University of Kansas, Lawrence.*

On the "List of Pteridophyta and Spermatophyta of northeastern North America," by DR. B. L. ROBINSON, *Curator of the Gray Herbarium of Harvard University.*

Noteworthy anatomical and physiological researches.

MALLINOA CORYMBOSA, Coult.

C.E. Faxon del.

PEREZIOPSIS DONNELL-SMITHII. Coult.

BOTANICAL GAZETTE

FEBRUARY, 1895.

New or noteworthy Compositæ from Guatemala.

JOHN M. COULTER.

WITH PLATES V AND VI.

Capt. John Donnell Smith has submitted to me his recent collections of Compositæ from Guatemala, and the following results are thought worthy of publication. All of the most critical material was taken to the Gray Herbarium and Library for final study, where every facility for work was provided through the courtesy of the curator, Dr. B. L. Robinson.

VERNONIA CANESCENS HBK.—Aquacatepec, Depart. Zacatepequez, alt. 4,300ft, March 1892, *John Donnell Smith* 2,837. Apparently quite common from Peru and Venezuela to Panama. Reported also from Nicaragua (*Wright*) and Huasteca (*Ervendberg*). Very closely related to *V. geminata* Less. of Brazil, and often confounded with *V. arborescens* Sw. of Central America.

Vernonia Luxensis, n. sp.—A shrub 3m high, glabrous except more or less pubescence in the inflorescence which forms large pyramidal clusters of more or less leafy panicles: leaves oval, tapering at both ends and petioled, upper ones often narrower, entire or obscurely toothed: involucral scales in five or six rows, innermost ones linear-oblong and often quite elongated, the outer ones gradually passing into much broader and shorter forms, all sharp pointed and membranous except for the greenish center and tip: heads 3 or 4-flowered, cylindrical, more or less pedicellate: achenes strigose pubescent, often densely so.—Santa Rosa, Depart. Santa Rosa, alt. 3–4,000ft, April 1892, *Heyde & Lux* 3,421.

Very nearly related to *V. Palmeri* Rose from Alamos (N. W. Mexico), but differing in pubescence, leaves and involucral scales.

Vernonia Heydeana, n. sp. Like the last; but lower (2[m] high), with broader leaves which are often not so taper-pointed at either base or apex, 6-flowered heads, involucral scales in but two or three much looser series and all of them obtuse, and glabrous achenes.—San Miguel Uspantán, Depart. Quiché, alt. 6–12,000[ft], April 1892, *Heyde & Lux* 3,392.

The two preceding species, with *V. Palmeri* Rose, may all be forms of one shrubby species which extends the whole length of western Mexico. With the material at hand the forms are readily separated, but they give evidence of such close relationship that more abundant material may show intergradations.

VERNONIA PATENS HBK.—Santa Rosa, Depart. Santa Rosa, alt. 3,000[ft], February 1893, *Heyde & Lux* 4,524.—A South American shrub 2 to 3[m] high, heretofore not reported north of Panama, but likely to have been confounded with *V. Deppeana* Less.

Vernonia Shannoni, n. sp.—A tree (height unreported): leaves long-oval, taper-pointed at each end, petioled, entire, glabrous: heads 5-flowered, somewhat closely corymbose and pedicellate: involucral scales in five or six rows, the inner ones elongated-oblong and obtuse, the outer ones becoming gradually shorter, more broadly ovate and acutish, all somewhat purplish-tinted and sparsely hairy on the margins: achenes glabrous.—"Continental divide," Depart. San Márcos, alt. 9,191[ft], January 1892, *W. C. Shannon* 605.

The material is very scanty, but seems sufficient for characterization and subsequent recognition. Apparently very nearly related to *V. liatroides* DC. and *V. serratuloides* HBK., but they are herbaceous. Mr. Shannon notes the tree as being "white-flowered."

Ageratum rugosum, n. sp.—More or less rough pubescent throughout: leaves short petioled, ovate, crenate, acuminate, thickish (almost coriaceous), somewhat scabrous above and more softly and abundantly hairy beneath especially along the prominent reticulations, 5 to 7[cm] long: heads purple-flowered, the linear involucral scales with slender often elongated acuminations: pappus of five lanceolate scales, but one, two or three of which taper into awns: achenes very glabrous.—Santa Rosa, Depart. Santa Rosa, alt. 3,000[ft], November 1892, *Heyde & Lux* 4,243.

The whole habit of this species is that of *A. corymbosum*

Zucc., to which doubtless it has often been referred; but its pappus refers it at once to EUAGERATUM and near to *A. conyzoides* L., from which species it differs in general habit, leaves, and pappus. I have seen an unnamed West Indian specimen all of whose pappus scales are not awned, but whose other characters refer it more nearly to *A. muticum* Grisebach, and which probably represents a form intermediate between *A. muticum* and *A. conyzoides*.

STEVIA NEPETAEFOLIA HBK. (?)—Ojo de Agua, Depart. Santa Rosa, alt. 3,500ft, September 1892, *Heyde & Lux* 3,780. The plant is evidently this species, but the leaves are less strongly toothed and less pubescent than in the usual form.

EUPATORIUM EHRENBERGII Hemsley.—Santa Rosa, Depart. Santa Rosa, alt. 3–4,000ft, March 1892, *Heyde & Lux* 3,427. A species closely related to *E. Benthamii* Klatt and *E. septuplinervium* Klatt, but those species have much more numerous flowers. Our specimens differ from Klatt's description of *Hebeclinum Ehrenbergii* Sch. Bip. (Flora, 1885, 202) in having about twenty-five flowers instead of fifty, and in the involucral scales being decidedly glandular tomentose, as is the whole inflorescence, and inclined to be obtuse, instead of "puberulent and acuminate."

EUPATORIUM FILICAULE Sch. Bip.—Jumaytepeque, Depart. Santa Rosa, alt. 6,000ft, November 1892, *Heyde & Lux* 4,234. In the Gray Herbarium there are specimens of this species extending from Venezuela (*Fendler*) to Orizaba, Mexico. A closely allied species in Chihuahua is *E. Palmeri* Gray. A character not mentioned by Dr. Gray (Proc. Amer. Acad. **21:** 383) in contrasting the two species may be of service in separating them. In *E. Palmeri* the involucral scales are very narrow, sharply pointed and entire; while in *E. filicaule*, although there are similar scales, most of the scales are apt to be a little broader and more or less toothed at apex, sometimes becoming blunt and with broad more or less toothed or incised apex. In our specimens the heads are 12-flowered. Characterizations of this species will be found not only in Proc. Amer. Acad. **21:** 383, but also l. c. **27:** 170.

Eupatorium griseum, n. sp. Whole plant (including both leaf surfaces) hirsutely and somewhat glandular pubescent, giving it a grayish cast: leaves opposite, perfectly cordate with a somewhat acuminate apex, sharply dentate, lower surface grayer and more hirsute than the upper, 8 to 10cm long

by 7 to 8^{cm} broad, rather long-petioled below, becoming sessile and much reduced towards and in the inflorescence which is open and comparatively few-headed: heads rather large (12^{mm} high), more than 20-flowered: involucral scales obtuse, glandular pubescent on the back and apt to be purplish-tinged, the inner narrower ones occasionally acutish, all conspicuously striate-nerved: achenes minutely pubescent on the sharp angles.—Casillas, Depart. Santa Rosa, alt. 4,000^{ft}, December 1892, *Heyde & Lux* 4,250.

In De Candolle's § SUBIMBRICATA, with the large-headed Brickellia-like forms, such as *E. Parryi* Gray and *E. Fendleri* Gray, but more nearly related to the South American *E. urticæfolia* L.

EUPATORIUM GUADALUPENSE Spr.—Rinconcito, Depart. Santa Rosa, alt. 4,000^{ft}, November 1892, *Heyde & Lux* 4,206. This widely distributed species has gone under the name of *E. paniculatum* Schrad. in the West Indies, *E. Sinclairii* Benth. in Central America, and *E. Guadalupense* Spr. on Guadalupe Island.

EUPATORIUM HEBEBOTRYA (DC.) Hemsley.—Chiapas, Depart. Santa Rosa, alt. 3,500^{ft}, December 1892, *Heyde & Lux*. A species of Costa Rica, and apparently reported but once from Mexico (*Haenke*).

EUPATORIUM PAUPERCULUM Gray.—Santa Rosa, Depart. Santa Rosa, alt. 4,000^{ft}, December 1892, *Heyde & Lux* 4,194. This species was first discovered in Arizona, then in Sonora, and now in Guatemala. The Arizona material, from which the original description was drawn, proves to be not at all representative. The Sonoran and Guatemalan specimens are more or less pubescent, with lanceolate (in the Guatemalan specimens very narrowly so) long acuminate leaves with tapering base and sharply toothed in the middle, loose almost diffuse inflorescence, and corolla more often pink than white.

EUPATORIUM POPULIFOLIUM HBK.—Volcan Tecuamburro, Depart. Santa Rosa, alt. 6,000^{ft}, February 1893, *Heyde & Lux* 4,521. This material has achenes somewhat pubescent. Evidently a very variable species in foliage, the leaves varying from lanceolate with attenuate base to very broad ovate with either truncate or cordate base. *Heyde & Lux* 2,840, from San Felipe, Depart. Retalhulen, alt. 2,050^{ft}, April 1892, has the usual glabrous achenes, and is reported as a showy virgate plant 14^{ft} high.

EUPATORIUM PYCNOCEPHALUM Less.—Santa Rosa, Depart. Santa Rosa, alt. 3–4,000ft, May and November 1892, *Heyde & Lux* 3,406 in part and 4,229; Jumaytepeque, Depart. Santa Rosa, alt. 6,000ft, January 1893, *Heyde & Lux* 4,219; San Miguel Uspantán, Depart. Quiché, alt. 6–12,000ft, April 1892, *Heyde & Lux* 3,397. Evidently the same as *E. Schiedeanum* Schrad. Very variable in foliage, but the intergradations are so complete that no varietal distinctions can be drawn. The variations extend from narrowly lanceolate with long acuminate apex to cordate ovate and even rotund towards and in the inflorescence. Reported to be a little more than three feet high.

EUPATORIUM SCHULTZII Sch. Bip.—Teocinte, alt. 2,500ft, February 1893, *Heyde & Lux* 4,515. Entirely too near *E. malvaefolium* DC., and the two should probably be merged. The present material has the involucral scales of *E. Schultzii*, but the heads are more than 20-flowered, as in *E. malvaefolium*, a larger number than is credited to the former species. Reported as nine feet high.

Eupatorium vernonioides, n. sp. of OSMIA.—Shrubby and leafy, with the general aspect of a *Vernonia*, more or less glandular pubescent in the region of the inflorescence and apt to be sparsely so upon the leaf veins (especially beneath), otherwise glabrous: leaves short-petioled, thickish but hardly coriaceous, lanceolate with tapering base and apex (perhaps the lower leaves broader and more rounded at base), entire or obscurely mucronulate-toothed, with prominent midrib and conspicuously reticulated beneath, dark green and somewhat shining above, paler and often reddish tinged beneath, 15 to 20cm long, 2.5 to 4.5cm broad: heads rather numerous in the open somewhat leafy cymes, about 9mm high and 40- to 60-flowered: lower scales of the cylindrical or urn-shaped involucre short and broad, with ciliate margins and glandular pubescence on the back, upwards becoming gradually narrower, longer, more delicate, less glandular and ciliate until the innermost linear scales are almost smooth; all obtuse except a short apiculation of the innermost ones; the striations not distinct, but obscure and irregular, the outer scales especially inclined to a purplish tinting: achenes glabrous (poorly developed in the material at hand).—Cenaguilla, Depart. Santa Rosa, alt. 4,000ft, November 1892, *Heyde & Lux* 4,240.

Related to *E. conyzoides* Vahl.

Willugbaeya globosa, n. sp.—A glabrous twiner or somewhat puberulent in the inflorescence: leaves ovate and acuminate, obtuse at base, with margins (which are obscurely mucronulate) revolute, 5-ribbed near the base and prominently cross-veined, long-petioled, blade 9 to 12^{cm} long, 5 to 7^{cm} broad: heads sessile in glomerate (head-like) clusters which are borne (one to seven in number, usually three or five) at the ends of the opposite somewhat wide-spreading branches of an elongated bracteate raceme: involucral scales very short (about one-third as long as the corolla and pappus), broad and truncate (sometimes a little notched), glandular-puberulent at apex: pappus white: corolla narrowly funnel form: achenes glabrous (or very sparsely pubescent under a lens).—Santa Rosa, Depart. Santa Rosa, alt. 4,000^{ft}, March 1892, *Heyde & Lux* 3,430.

This species is listed as *Mikania globosa* Coulter, n. sp. in the forthcoming part of John Donnell Smith's "Enumeratio Plantarum Guatemalensium," where it seemed desirable to make the nomenclature consistent with that of the other parts. The inflorescence is striking, with its display of globose heads, and the species resembles closely in habit and structure *Mikania smilacina* DC. of Brazil.

WILLUGBAEYA SCANDENS (L.) Kuntze. (*Mikania scandens* Willd.)—Santa Rosa, Depart. Santa Rosa, alt. 3–4,000^{ft}, June 1892, *Heyde & Lux* 3,434. A form with purple flowers and reddish pappus, which is easily separated from the typical form, but which is referred by Hemsley to *M. scandens*.

Coleosanthus Pacayensis. (*Brickellia Pacayensis* Coulter).—Teocinte, Depart. Santa Rosa, alt. 2,500^{ft}, January 1893, *Heyde & Lux* 4,218.

ASTER SPINOSUS Benth.—Santa Rosa, Depart. Santa Rosa, alt. 3–4,000^{ft}, April and December 1892, *Heyde & Lux* 3,424 and 4,210. The development of the characteristic spiny branches in these Guatemalan forms is much stronger than in the forms heretofore collected in Northern Mexico and adjacent United States; a development that appears also in specimens from Costa Rica. The spines are often very strong and thick set, flattened like sword blades, 2.5 to 5^{cm} long, evidently doing leaf-work, while the leaves are reduced to the merest rudiments, very different from the "soft subulate spines" of the more northern forms. The longer spines frequently branch.

In the original description Bentham questions the generic reference, a question which may still be seriously raised. Were not the genus Aster so all-embracing it would seem better to separate this species from it generically. It has no stamens in the ligulate flowers, the styles are very short and obtuse, the ligules are exceedingly small, and the whole habit of leaf reduction and spiny phyllocladia is peculiar.

ASTER JAMAICENSIS Less. (*Erigeron Jamaicensis* L.)—Santa Rosa, Depart. Santa Rosa, 3–4,000ft, June 1892, *Heyde & Lux* 3,363. This species of the West Indies has also been found occasionally in southern Mexico. I very much doubt its proper reference to Aster.

CONYZA CORONOPIFOLIA HBK. (Incl. *C. hirsuta* HBK.)—Chiul, Depart. Quiché, alt. 8,000ft, April 1892, *Heyde & Lux* 3,378. Exceedingly variable in foliage even on the same plant. Our specimens represent the very hirsute form with linear-lanceolate mostly entire (but frequently 1- or 2-lobed) leaves described by Kunth as *C. hirsuta*, and usually maintained as a distinct species. The two, however, completely intergrade, and different branches of the same plant will sometimes show all the differences between *C. coronopifolia* and *C. hirsuta*.

MALLINOA, n. gen. of INULOIDEÆ?—Heads many-flowered, homogamous, the flowers perfect: involucre campanulate, with three or four series of imbricate striate bracts, the outer ones shorter: corolla tubular, somewhat narrower below and with a much constricted and easily separable base, 5-toothed, the teeth hairy outside: anthers appendaged, sagittate at base: style-branches long, clavate and obtuse, the conspicuous hairy appendages representing more than half the length: achenes linear, 5-angled, with a prominent indurated base and constricted above to meet the distinct pappus ring which bears numerous stout barbellate bristles as long as the corolla.

Mallinoa corymbosa, n. sp.—Herbaceous, 40 to 50cm high, leafy and hairy at base, naked, smooth and corymbosely branching above: leaves opposite, more or less woolly pubescent on both sides, especially along the venation, rather long petioled, ovate and dentate, obtuse, paler and conspicuously reticulate beneath, 3 to 7cm long (blade), above reduced to bracts: heads about 5mm high, solitary at the ends of the elongated corymbose branches: involucral bracts smooth and striate, oblong, the outer series somewhat shorter, the inner

ones equal, very obtuse, more or less scarious margined: achenes sharply 5-angled, somewhat hairy, especially on the angles.—PLATE V.

Jumaytepeque, Depart. Santa Rosa, alt. 6,000^{ft}, December 1892, *Heyde & Lux* 4,255.

To decide the affinities of this genus is very perplexing, The style characters are those of EUPATORIACEÆ, and its pappus coalesced at base into a prominent ring suggests the Brazilian genus *Symphyopappus* Turcz., but the distinctly sagittate anthers are opposed to such reference. It seems also to resemble certain groups of SENECIONIDÆ, and this may be the true reference, but the involucre is hardly consistent with it. It is tentatively referred here to INULOIDEÆ, to which group it is as easily referred as *Dimeresia* Gray, with which genus it has a number of important characters in common.

NOCCA SUAVEOLENS Cass. (*Lagascea suaveolens* HBK.).—Carrizal, Depart. Santa Rosa, alt. 5,000^{ft}, November 1892, *Heyde & Lux* 4,227. A somewhat variable species, which also includes *L. helianthifolia* HBK., *L. latifolia* DC., and *L. macrophylla* Steud. *Lagascea* Cav. is 1,803, and *Nocca* Cav. is 1,794.

DESMANTHODIUM GUATEMALENSE Hemsley.—Volcan Acatenango, Depart. Zacatepequez, alt. 12,000^{ft}, August 1892, *W. C. Shannon* 3,693. The only record I find of this very interesting plant is the original collection by Salvin on Volcan de Fuego, at 6,000^{ft}, in which material the achenes were immature. The specimens before me have perfect achenes, which show the oboval-oblong outline of the other species, are perfectly smooth, and become black and hard, but instead of being biconvex in section have a flat face and a prominently angled face, giving a low triangular section.

Polymnia Quichensis, n. sp.—Smooth, excepting the more or less roughened leaves, about 1^{m} high: leaves ample, opposite, ovate-lanceolate, acuminate, tapering at base to a short petiole, dentate or denticulate (sometimes almost entire), moderately scabrous above and somewhat pubescent beneath, especially upon the conspicuous reticulations (becoming smoother with age), 12.5 to 25^{cm} long, 5 to 7.5^{cm} wide: heads solitary or few in a terminal corymb whose lateral branches bear at least a pair of ovate (sometimes narrower) acute leaves; the disk about 15^{mm} broad: outer involucral bracts broadly ovate and acute: rays 7 to 15, yellow, linear-oblong,

hairy at base, about 2^{cm} long: disk-corollas tubular-inflated from near the base, prominently glandular-nerved: achenes 5^{mm} long.—Chiul, Depart. Quiché, alt. 8,000^{ft}, April 1892, *Heyde & Lux* 3,375.

Very closely related to the Chilian *P. glabrata* DC. according to the description in DC. Prodr. **5**: 515.

JAEGERIA HIRTA Less. includes *Spilanthes sessilifolia* Hemsley.—San Miguel Uspantán, Depart. Quiché, alt. 6–12,000^{ft}, April 1892, *Heyde & Lux* 3,395, 3,794, 3,796.

SCLEROCARPUS DIVARICATUS Benth. & Hook. was sent out in a previous distribution as *S. uniserialis*, no. 2,376.

MONTANOA MORITZIANA Sch. Bip.—Coban, Depart. Alta Vera Paz, alt. 4,300^{ft}, November 1885, *Tuerckheim* 814. I have not discovered any description of this species, the material having been named from Andean specimens so labelled and distributed by Sonders and by André.

MONTANOA PATENS Gray.—Jumaytepeque, Depart. Santa Rosa, alt. 6, 000^{ft}, December 1892, *Heyde & Lux* 4,216. The specimens are more bushy and profusely flowered than those heretofore collected. The leaves are densely and softly pubescent beneath, glabrous or nearly so above. The species is very near *M. arborescens* DC., to which some of its forms have at times been referred.

Montanoa Samalensis, n. sp. — Apparently a suffruticose plant, about 3^{m} high; branchlets more or less woolly pubescent (becoming glabrate), the inflorescence densely so: leaves (only upper ones seen) petioled, ovate-lanceolate with a rhombic short-cuneate triplinerved base tapering into a more or less winged petiole, acuminate, crenate or somewhat toothed, scabrous-puberulent above, pubescent beneath, 20 to 30^{cm} long (including petiole), 7.5 to 10^{cm} broad in widest part; those that subtend or belong to the inflorescence narrowly lanceolate, acute or acuminate, wing-petioled, nearly or quite entire (the lower ones 15 to 17^{cm} long): inflorescence a lax leafy few-flowered trichotomous cyme: heads long-peduncled, 7 to 9^{mm} high, with about ten narrowly to broadly spatulate white (yellowish in drying), more or less pubescent rays 10 to 15^{mm} long: involucral scales ovate, acute, woolly pubescent: chaff of the receptacle more or less toothed towards the base, broadly truncate, the midrib ciliate on the back and extended as a prominent mucronate point: disk corollas yellow and pubescent.—Rio Samalá, Depart. Retalhulen, alt. 1,700^{ft}, April 1892, *John Donnell Smith* 2,858.

In the rhombic base of the leaves there is indication that the lower leaves may be three-lobed.

Verbesina Donnell-Smithii, n. sp. of VERBESINARIA.—Pubescent, becoming glabrate, about 5^{m} high: stem and branches wingless: leaves ovate to lanceolate, scabrous puberulent above, pubescent beneath, tapering to a more or less winged petiole, acuminate, from sharply serrate or even toothed to almost entire with a few mucronulations, 10 to 20^{cm} long, 3 to 5^{cm} broad: heads about 10^{mm} high, rather numerous in a spreading cyme: involucral scales oval, obtuse, erect and pubescent: chaff of the receptacle pubescent, as are the very broad and somewhat toothed wings of the achenes above and the stout awns.—San Miguel Uspantán, Depart. Quiché, alt. 6–12,000^{ft}, April 1892, *Heyde & Lux* 3,385.

Related to *V. Virginica* L., but distinct enough from the forms of that variable species that I have seen, notably so in the size of its heads.

OTOPAPPUS CURVIFLORUS Hemsley, var. **glabratus,** n. var. Leaves almost entirely glabrous and very long acuminate, only vestiges of the scabrous character above, the lower surface glabrous (instead of woolly pubescent).—Jumaytepeque, Depart. Santa Rosa, alt. 6,000^{ft}, November 1892, *Heyde & Lux* 4,235.

O. curviflorus Hemsley = *Salmea curviflora* R. Br. and *Zexmenia salmeoides* Sch. Bip. It is a serious question whether *O. curviflorus* should not be the basis of a new genus, for the characters are not strictly those of either *Salmea* or *Otopappus*, although the latter genus was extended by Hemsley to include it.

COREOPSIS GALEOTTII Hemsley was distributed in a previous collection as *C. Mexicana* Hemsley, no. 3,792.

COREOPSIS TRIFOLIATA Bertol.—Buena Vista, Depart. Santa Rosa, alt. 5,500^{ft}, December 1892, *Heyde & Lux* 4,193. Apparently reported heretofore only from Volcan de Agua by Velasquez, and described by Bertolini in Fl. Guat.

BIDENS ALAUSENSIS HBK.?—Embaulada, Depart. Zacatepequez, alt. 5,500^{ft}, December 1889, *Heyde & Lux* 4,503; Santiago, same depart., alt. 6,500^{ft}, 1891, *Rosalió Gómez.* A number of South American species of *Bidens* appear in the Guatemalan collections, but there is such confusion of descriptions and of specimens in herbaria, that determinations must be tentative. This species has been reported also from S. Mexico.

BIDENS ANDICOLA HBK.?—San Miguel Uspantán, Depart. Quiché, alt, 6,000ft, May 1892, *Heyde & Lux* 3,404, 3,788. This reference to a species of the Andes of Ecuador is made with some hesitation, on account of lack of type material. With published descriptions and distributed material it accords fairly well. Perhaps the same reference should be made of *John Donnell Smith* 1,678, from Samac, Depart. Alta Verapaz, alt. 4,600ft, but the material is entirely too immature for definite statement.

BIDENS HIRTELLA HBK.—Santiago, Depart. Zacatepequez, alt. 6,500ft, 1891, *Rosalió Gómez* 1,074. This species seems to have been referred only to Mexico and then doubtfully, as though it had not been rediscovered. The material in hand conforms exactly with the published description, but there has been no opportunity of comparison with authentic specimens.

BIDENS HUMILIS HBK.—At the summit of Volcan Acatenango, Depart. Zacatepequez, alt. 12,400ft, August 1892, *W. C. Shannon* 3,691. Heretofore reported only from the mountains of Ecuador. The peduncles and involucral scales are very often hairy, and the heads vary much in size, sometimes becoming as large as those of *B. grandiflora*.

CALEA INTEGRIFOLIA Hemsley, var. **dentata,** n. var. Leaves much thinner, glabrous (except perhaps a little sparse pubescence beneath), very narrowly lanceolate to linear, with conspicuous mucronulate teeth, and tapering into a long almost caudate acumination, the leaves subtending the inflorescence elongated.—Nebaj, Depart. Quiché, alt. 7,000ft, April 1890, *Heyde & Lux* 4,506.

SCHKUHRIA ANTHEMOIDES (DC.) (*Hopkirkia anthemoides* DC. *Schkuhria Hopkirkia* Gray).—*Heyde & Lux* 3,802.

GALEANA HASTATA Llav. & Lex.—Santa Rosa, Depart. Santa Rosa, alt. 3–4,000ft, July 1892, *Heyde & Lux* 3,364. The plants are much more leafy than usual, with larger leaves and a fewer-flowered inflorescence than heretofore recorded.

TAGETES LUCIDA Cav.—Santiago, Depart. Zacatepequez, alt. 6,500ft, 1891, *Rosalió Gómez* 1,063; 1892, *Heyde & Lux* 3,798. Our 3,798 is more branching than usual, with obconical (rather than cylindrical) involucres which are 7-toothed (rather than 5) and 15 to 17-flowered (instead of 5 to 7), but the intergradations seem to be too complete for varietal separation.

TAGETES TENUIFOLIA Cav.—*T. peduncularis* Lag. & Rod.

It seems probable that these two species thus merged, with some others, should be included in *T. patula* L.—San Cárlos, Depart. Quezaltenango, alt. 8,622ft, December 1891, *W. C. Shannon* 598.

PECTIS CANESCENS HBK., var. **villosior,** n. var.—Stems and leaves much more woolly pubescent, the involucral bracts densely so, being like those of *P. Liebmannii* Sch. Bip.—Santa Rosa, Depart. Santa Rosa, alt. 3–4,000ft, March and May 1892, *Heyde & Lux* 3,401 and 3,413.

SENECIO GHIESBREGHTII Regel, var. **Uspantanensis,** n. var.—Leaves entire, elongated oblong and acuminate.—San Miguel Uspantán, Depart. Quiché, alt. 6–12,000ft, April 1892, *Heyde & Lux* 3,368; also distributed in previous collection as *S. Ghiesbreghtii*, no. 1,598, with leaves similar but with marginal mucros; also *Botteri*, 609 and 820 from Orizaba. In looking over the allied tree-forms, *S. Ghiesbreghtii* Regel, *S. grandifolius* Less., and *S. arborescens* Steetz, it becomes evident that we are dealing probably with a single species having leaves varying from pinnately divided to entire. *S. grandifolius* Less. must certainly absorb *S. arborescens* Steetz, but I do not feel the same confidence as yet in such a disposition of *S. Ghiesbreghtii* Regel, although Hemsley refers the latter to *S. grandifolius*, but keeps *S. arborescens* distinct.

SENECIO SCHUMANNIANUS Schauer.—Chiul, Depart. Quiché, alt. 8,000ft, April 1892, *Heyde & Lux* 3,377. I have no record of the discovery of this interesting species other than that of Aschenborn about Zimapan. Although no authentic specimens have been accessible Schauer's description in Linnaea completely accords with our plant.

WERNERIA NUBIGENA HBK.—Volcan de Tajumulco, Depart. San Márcos, alt. 12,000ft, January 1892, *W. C. Shannon* 607. A very interesting discovery of a high Andean genus, not reported before north of the high mountains of Bolivia.

PEREZIOPSIS, n. gen. of MUTISIACEÆ.—Heads rather few-flowered (10–15), homogamous, the flowers perfect: involucre conical, with three or four series of dry loosely imbricated narrow bracts, the outer ones short and grading into the bractlets, the inner ones becoming successively more elongated: receptacle densely pilose: corolla elongated, deeply bilabiate, the upper lip broad and 4-toothed, the lower of a single narrowly linear petal, all the lobes erect (not even

spreading); the lower portion of the tube sharply 5-angled with tuberculate ridges, differing sharply from the upper portion: anthers caudate; filaments free and pubescent, arising from the top of the angled base of the corolla tube: stigma lobes short and obtuse, coalescent to maturity (but easily separable), sharply deflexed at the summit of the anther tube; style with an indurated bulbous base which detaches readily from the achene, which is linear and pubescent: pappus of numerous conspicuous puberulent slightly tawny bristles about as long as the flowers.

Pereziopsis Donnell-Smithii, n. sp.—Probably woody below, 1.8 to 2.4[m] high, densely woolly tomentose at least above: leaves alternate, ample, pinnately divided, white with a dense pannose tomentum beneath, more or less floccose woolly above and becoming glabrate; terminal lobe ample, broadly deltoid, irregularly lobed and dentate, conspicuously palmately veined, 20[cm] long by 25[cm] broad at the almost truncate base (dimensions doubtless larger in the lower leaves); lateral lobes (usually two) distant and very much smaller, the intervening rhachis and petiole more or less winged: inflorescence an ample naked corymb, with large terminal heads (about 3[cm] high) on the elongated branches, the ultimate divisions bracteate: involucral scales narrowly linear and long acuminate, more or less pubescent and purplish tinged, the inner ones becoming as long as or even longer than the head: flowers over 20[mm] long.—Rio de Los Esclavos, Depart. Santa Rosa, alt. 2,500[ft], February 1893, *Heyde & Lux* 4,527. —PLATE VI.

Herbarium Lake Forest University.

EXPLANATION OF PLATES V AND VI.

V. *Mallinoa corymbosa.* Fig. 1. Plant, nat. size.—Fig. 2. A head, enlarged.—Fig. 3. A flower, enlarged.—Fig. 4. Two stamens, enlarged.—Fig. 5. A pistil, enlarged.

VI. *Pereziopsis Donnell-Smithii.* Fig. 1. Portion of a flower cluster, nat. size.—Fig. 2. A leaf, natural size.—Fig. 3. A flower, enlarged.—Fig. 4. The same laid open, enlarged.—Fig. 5. A stamen, enlarged.—Fig. 6. A pistil, enlarged.—Fig. 7. An achene, nat. size.

A preliminary paper on Costaria with description of a new species.[1]

DE ALTON SAUNDERS.

WITH PLATE VII.

In the latter part of last July, I found on the shores of Monterey Bay a few imperfect specimens of one of the Laminariaceæ which seemed to me at once to be different from anything described in the literature accessible in the Hopkins Sea Side Laboratory. It was evidently a *Costaria*, but the two described species of *Costaria* have five narrow ribs, while this plant had one broad one.

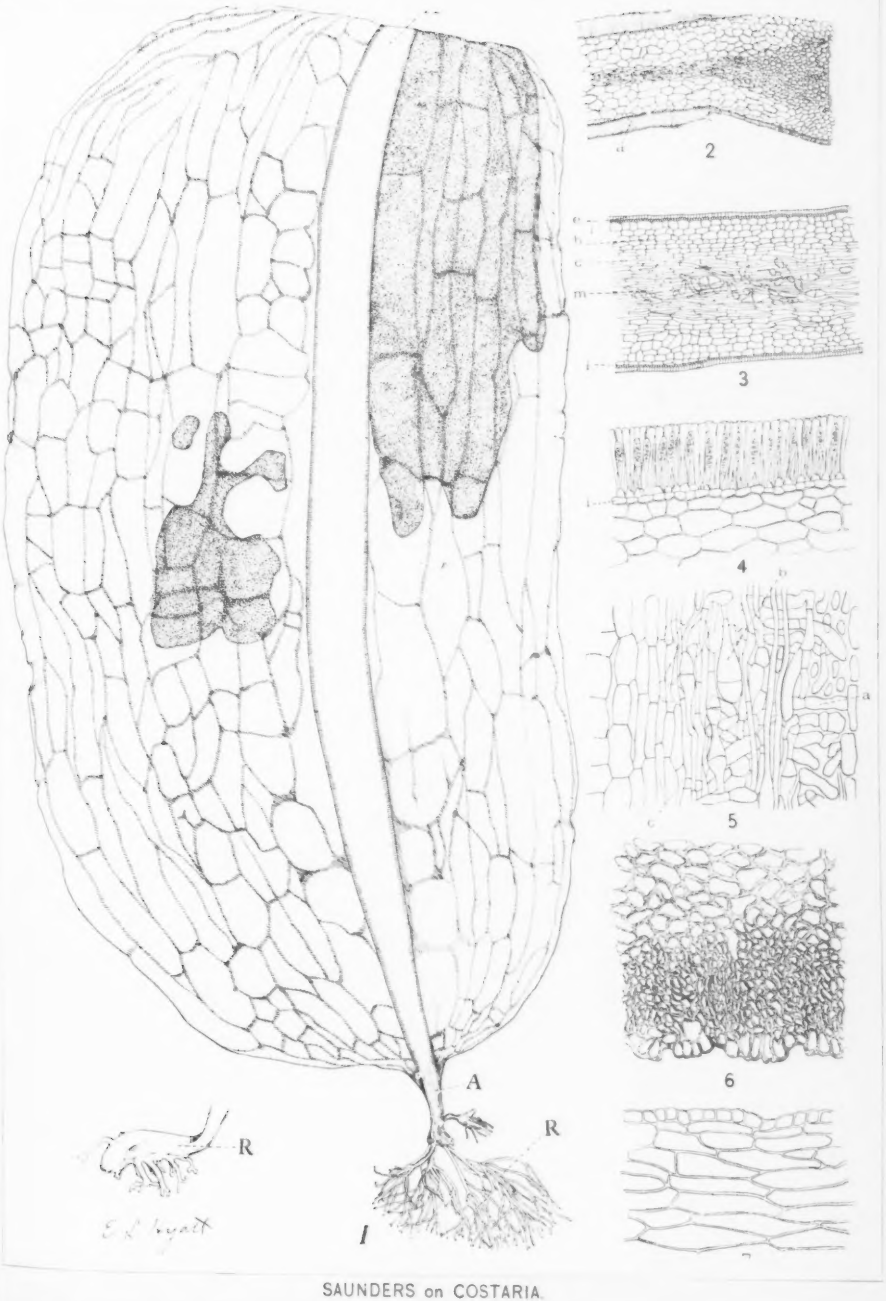
A few days later I collected the same plant a mile further east near the steamship landing at Monterey. In the course of a week or so two of the Stanford students who were dredging for the zoologist of the Hopkins Laboratory brought me several fragments of the same *Costaria*. These fragments had been brought up by the dredge a half-mile from the shore from a depth of about fifty feet. A systematic search showed that the plant was quite common, at least in one part of the bay, growing in large clusters attached to rocks twenty to thirty feet from the shore, in eight to fifteen feet of water. As one looked at it waving back and forth in eight or ten feet of water he would take it at once to be *Dictyoneuron Californicum* Rupr., which is abundant all along the Californian coast.

I obtained a large number of plants, many of which were in fruit. A careful search along the shore of other parts of the bay, and also of the neighboring ocean, has so far failed to reveal any trace of the plant.

I am informed that specimens have been sent to at least one of the leading phycologists of the United States, and he referred it to *Costaria costata* (Turn.) (*C. Turneri* Grev.). The specimens sent must have been very imperfect indeed to give one such an impression as will be seen by comparing *C. costata* (Turn.) with this plant.

GENERAL DESCRIPTION.—The plant is of an olive-green color, and varies in shape from oblong to lanceolate linear.

[1]Read before the Botanical Seminar, University of Nebraska, December 22, 1894.



SAUNDERS on COSTARIA.

The blade is thin and very brittle, and is covered throughout with peculiar reticulations which diminish in size as they approach the growing point (the union of blade and stipe). The midrib is about twice the thickness of the body of the plant, and is broad and smooth, no reticulations ever crossing it. The reticulations vary much in prominence; in some individuals they are barely visible, while in others they are very prominent. The midrib also varies much in plants of the same or nearly the same size. In some plants evidently mature it is little over $\frac{1}{4}^{\text{in}}$, while in others of about the same size it is often 2^{in} broad. At the base the plant is either heart-shaped and abruptly contracted, or in smaller specimens lanceolate and gradually contracted into a short thick stipe. From the ends and sides of the stipe innumerable dichotomously branched rootlets are given off which attach the plant very firmly to rocks, etc. Frequently the lower half of the stipe is turned abruptly at right angles to the upper half and the rhizoids are then attached to the lower surface (fig. 2, *R* and *R'*).

HISTOLOGY.—A cross section of the stem reveals three kinds of tissue; the epidermis, hypodermis and medullary layer (fig. 3, *e*, *h*, and *m*). The epidermis consists of a single row of cells oblong in cross-section, 16–20μ in length, 8μ broad, the outer wall considerably thickened. In a longitudinal section they are the same shape, showing that they are quadrilateral, the long axis lying in a radial plane (fig. 3, *c*).

The hypodermis is made up of five rows of parenchymatous cells. The outer hypodermal row is made up of very small (8μ broad) rounded cells. The remainder of the hypodermis is composed of large, irregular, thin walled cells, which increase somewhat in size towards the medullary layer (figs. 3, and *h*, and 4). The chloroplasts are confined mostly to the outer two or three rows of the hypodermis.

The medullary layer presents a very interesting structure. We may distinguish three varieties of cells in it: (*a*) Two or three rows of narrow, elongated, rather thick walled cells, along the sides next to the hypodermis (figs. 3 and 5, *c*). (*b*) Large oval or flask-shaped cells (*Schleimgänge*) some of which seem to have been formed by the union of two cells. Connected with one end of the flask-shaped cells there are long, narrow cells with few or no cross partitions. The tubular cell sometimes ends blindly and sometimes seems to unite with other cells. The

opposite end of the flask-shaped cell is usually closed and not connected with any other cell (fig. 5, *b*). (*c*) In the central part of the medullary layer between the flask-shaped cells there are many oblong, thin-walled cells running at right angles to the direction of growth. Occasionally they are found singly, but more often there are several united, forming a chain which often reaches across the medullary part (fig. 5, *a*). There is no difference in structure between the midrib and the rest of the blade. The greater thickness of the midrib is caused by an increase in the thickness of the medullary layer (fig. 2).

The reproduction of this plant is in no way different from the other species of the Laminariaceæ. Unicellular zoosporangia protected by paraphyses are borne in large irregular patches on every part of the blade. In some luxuriant individuals I have found the patches of zoospores extending upon or even across the midrib. The zoospores are evidently developed from the epidermal cells, for we find in cross-sections of fruiting specimens the outer row of small hypodermal cells just beneath the zoosporangia (comp. figs. 3 and 4, *i*).

A study of the stipe reveals an entirely different structure. It is very tough and rigid, and is composed entirely of cells which are about twice as long as broad, and much smaller in the hypodermal than the medullary region. In fact in many of the sections there seems to be, especially in the hypodermal region, little or no space between the cell walls. The epidermis of the stipe is composed of very irregular thick walled cells, the walls of which are of a brownish color (fig. 6).

In the rootlets, especially towards the apex, the cell walls are much thinner, the cells larger and longer (fig. 7).

NOMENCLATURE. — In looking up the descriptions of the two recognized species of *Costaria* I find that the names of the two have been changed several times without right or reason for so doing. As we are gradually approaching a stable nomenclature, it seems proper that at this time we should restore to these plants the names which rightfully belong to them.

The common species on the Californian coast has been called *Costaria Turneri* Grev. It is not, however, *Costaria Turneri* Grev., but *Costaria Mertensii* J. Ag.[2]

[2] Species, genera et ordines Algarum **1**: 140. 1848.—Neither should the name be written *Costaria Mertensii* (Mert.) Post & Rupr. as Kjellman has done in Engler & Prantl's Pflanzenfamilien **1**[2]: 257.

The other species, *Costaria Turneri* Grev., was named *Fucus costatus* by Turner in 1819,[3] but Greville in 1830 changed it to *Costaria Turneri* Grev.[4]

Under the present rules of nomenclature we must then return to Turner's specific name which results in *Costaria costata* (Turn.).

Since the two species have been somewhat confused and the genus will have to be broadened somewhat to include the new species, the following synopsis may not be amiss.

To some it may seem that the possession of a single broad rib ought to be considered as a generic distinction, but after a careful comparative study of the structure of this plant with *Costaria Mertensii* J. Ag., I prefer to broaden the generic description enough to include this plant.

COSTARIA, Greville. Alg. Brit., Syn. p. XXXIX. 1830.

Plant undivided, *one* to five-ribbed; ribs when more than one, radiating from a simple, plain stipe. Fruit as in Laminaria, indefinite brown spots on any part of the plant.

§ I. *Plant 5-ribbed.*

COSTARIA MERTENSII, J. Ag. Spec. gen. et ordin. Alg. **1:** 140. 1848.

Fucus costatus Mert. Jun. Lim. 4:—. 1829.
Costaria Turneri Post & Rupr. Illust. Alg. 12. *pl. 24.*

Plant from five inches to a foot broad; stipe expanding from the base into a plain undivided reticulate blade. Rootlets dichotomously branched.

Common on the Californian coast.

Costaria costata (Turn.), nom. nov.

Fucus costatus Turn. Fuci, etc. *pl. 226.*
Costaria Turneri Grev. Alg. Brit., Syn. p. XXXIX.

Plant seldom over two inches broad; lanceolate, two feet long. Rootlets nearly simple.

As far as I can discover, this plant has never been reported for the Californian coast before. The information I have been able to obtain in reference to its distribution is from Agardh (Species, Genera et Ordines Algarum, 139–140). He says of its habitat, "On the Pacific shores of Central America or ? North America." The interrogation mark before North America is explained by a sentence a few lines further on

[3]Turner, Fuci, etc. **4:**—.*pl. 226.*
[4]Alg. Brit., Synopsis p. XXXIX.

where he says, "In one place in Turner's work, the native country of this plant is said to be Central America, in another place, North America." I have two complete specimens, one in fruit, that I collected a short distance from Pacific Grove, Cal., which are unquestionably this plant.

§ II. *Plant 1-ribbed.*

Costaria reticulata, n. sp.—PLATE VII.

Plant thin, olive green, two feet or more in length, two to ten inches broad; stipe short, $\frac{1}{2}$–$1\frac{1}{2}$ inches in diameter, furnished with numerous dichotomously branched rootlets. Plant furnished with a broad central midrib twice the thickness of the remainder of the blade; midrib one-half to two inches in width; the surface, except the midrib, covered with coarse reticulations which gradually diminish in size towards the union of blade and stipe. Zoosporangial areas, dark brown patches of olive brown spores scattered over the surface of the blade, often covering midrib; sporangia indistinguishable from those of *Costaria Mertensii* J. Ag.—Habitat south shore of Monterey Bay, near Pacific Grove, Cal.

Lincoln, Neb.

EXPLANATION OF PLATE VII.

Fig. 1. *Costaria reticulata*, n. sp. Reduced one-half.—Fig. 2. Transection, showing union of body and midrib, and the zoosporangia. × 70.—Fig. 3. Longisection of midrib. × 70.—Fig. 4. Transection showing zoosporangia. × 330.—Fig. 5. Longisection of midrib, showing *c*, *h*, and *m*, of fig. 3. × 330.—Fig. 6. Transection of stipe. × 330.—Fig. 7. Transection of rootlet near tip.

Notes on our Hepaticæ. III.[1]

The distribution of the North American Marchantiaceæ.

LUCIEN M. UNDERWOOD.

The genus hitherto known as *Fimbriaria*, one of the largest of the genera of marchantiaceous hepatics, has to suffer now for the failure in the past to recognize the rights of priority; and strangely enough there seems to be considerable difference of opinion still as to the proper name of the genus. The case is as follows: In 1810 Palisot de Beauvais established the genus Asterella with two species, *A. tenella* (*Marchantia tenella* L.) and *A. hemisphaerica* (*Marchantia hemisphaerica* L.). These are now recognized as belonging to two diverse genera. In 1818 Raddi established the genus *Rebouillia* for the latter species and in 1820 Nees established the genus *Fimbriaria* (by error *Fimbraria*) for the group which now includes the former, though that species was not included in *Fimbriaria* until 1838[2]. In 1829 Corda established the genus *Hypenantron* which is the equivalent of *Fimbriaria*. The genus *Rhacotheca* Bischoff (1844), and the genus *Octoskepos* Griffith (1849), were founded on species that will also be included in the same genus.

The case as we see it now is perfectly clear, and yet Lindberg (1868) complicated the matter by adopting the genus *Asterella* for *Rebouillia*, in which he was followed by Dumortier and many others, including recent American writers. Trevisan was the first to clear up the matter, but in his later work he fell from the estate he had reached and again wrote *Asterella* for *Rebouillia*. In his earlier position he was followed by Lindberg (in his later writings commencing with 1879), by Massalongo and by many others. Trevisan in his later work (1877) was the first to adopt *Hypenantron* for *Fimbriaria* and in this he has been followed by Kuntze and Schiffner.

It is clear that the genus *Asterella* in 1818, after Raddi had

[1] Preceding numbers of this series are in this journal (1) **14**: 191–198. 1888.—(2) **19**: 273–278. 1894.

[2] *Marchantia tenella* L. had the further misfortune to be for a long time confused with one or more European species.

established *Rebouillia*, contained what was left in the genus after the one species was taken from it. That Nees established *Fimbriaria* without recognizing the fact that one of its most typical species already stood as the sole representative of a genus does not alter the case. Since *Fimbriaria* Nees cannot possibly stand, as there is an earlier *Fimbriaria* Stackh. (1809) among the algæ, there is no possible excuse for using *Hypenantron* when there is already an appropriate generic name nineteen years older. There is even much less excuse for the adoption of *Asterella* for *Rebouillia* since the latter name was the first to be separated from the former. The fact that *Asterella* has been used for another genus will make a little confusion for a time, but that would not warrant the cancellation of such an appropriate name as has been done by Schiffner in Die natürlichen Pflanzenfamilien (Engler-Prantl).

The American species under their new names are as follows:—

1. ASTERELLA TENELLA Pal. de Beauv. Encyc. Meth., Bot. **3:** 110. 1810.

Marchantia tenella L. Sp. Pl. 1137. 1753.
Fimbriaria nigripes Bisch. MS. in Lehm. Pug. Pl. 6: 19. 1834.
Fimbriaria tenella Nees, Europ. Leberm. 4: 271. 1838.
Fimbriaria mollis Tayl. Lond. Jour. Bot. 5: 411. 1846.

This species is very widely distributed throughout Eastern America. Specimens have been received as follows: Massachusetts, *Cummings, Crocker, Underwood;* New York, *Fischer;* Ontario, *Macoun;* Ohio, *Werner, Herrick;* Indiana, *Underwood;* Illinois, *Seymour;* Pennsylvania, (hb. Taylor, type of *F. mollis*), Delaware, *Commons;* Virginia, (ex hb. James); South Carolina, *DuBois;* Georgia, *Underwood;* Tennessee, *Bain;* Missouri, *Demetrio.* Sterile forms collected in Nebraska, *Webber*, and in Minnesota, *Holzinger*, have been hitherto referred to this species but these need the confirmation of mature specimens as they differ in being dark purple beneath, and the Nebraska specimens at least possess whitish scales.

2. **Asterella Californica** (Hampe), nom. nov.

Fimbriaria Californica Hampe MS. *n. n.* in Aust. Hep. Bor.-Am. *135;* Undw. Bull. Ill. State Lab. Nat. Hist. 2: 41. 1884.

This species is found throughout California from San Francisco southward to San Diego and Guadeloupe Island, having been sent by various collectors. Sterile specimens have also

been sent from British Columbia by Macoun, and it will be found doubtless throughout the entire Pacific region.

3. **Asterella Bolanderi** (Aust.), nom. nov.

Fimbriaria Bolanderi Aust. Proc. Phila. Acad. 1869: 230. 1869.

California: San Rafael, *Bolander;* Auburn, *Bolander;* Mill Valley, *Howe.*

The specimens collected by Coville on the Death Valley Expedition and referred by me to this species are rather *A. gracilis.*

4. **Asterella violacea** (Aust.), nom. nov.

Fimbriaria violacea Aust. Bull. Torr. Bot. Club 3: 17. 1872.

Central California, *Bolander, Coulter, Howe.*

5. **Asterella nudata** (M. A. Howe), nom. nov.

Fimbriaria nudata M. A. Howe, Erythea 1: 112. 1893.

Central and Southern California: Mill Valley, Marin co., *Howe*; Jackson, Amador co., *Howe;* Pasadena, Los Angeles co., *Mc Clatchie.* A very well marked species.

6. ASTERELLA FRAGRANS (Nees) Trevis. Rend. R. Ist. Lomb. Sc. II. **7**: 10. 1874.

Marchantia fragrans Schleich. *n. n.* in Exsicc. cent. III. *64.*
Fimbriaria fragrans Nees, Hor. Phys. Berol. 45. 1820.

New Mexico, *Fendler;* Idaho, *Leiberg;* Telegraph Creek, near Alaska, *Dawson.* Remarkable for its profuse white scales that extend far beyond the margin.

7. **Asterella gracilis** (Web. f.), nom. nov.

Marchantia pilosa Wahl. Fl. Lapp. 339. 1812; not *M. pilosa* Horn. Fl. Dan. 8: *pl. 1426.* 1810.
Marchantia gracilis Web. f. Hist. Musc. Hepat. Prodr. 105. 1815.
Fimbriaria gracilis Lindb. Not. pro Fauna et Flora Fenn. 10: 282. 1868.
Fimbriaria pilosa Tayl. Trans. Linn. Soc. 17: 386. 1837.
Asterella pilosa Trevis. Rend. R. Ist. Lomb. Sc. II. 7: 10. 1874.

The synonymy of this species presents a complicated tangle, and the species has had the misfortune to be over much named. Limpricht asserts that *Marchantia Ludwigii* Schwaegr. Hist. Musc. Hepat. Prodr. 33. 1814 is identical with this species, as had been suggested before by Lindberg. If this proves true, then the name of the species will be *Asterella Ludwigii* (Schwaegr.). Until this can be determined the name will have to be as above, since the specific name *pilosa* is untenable as a homonym.

British Columbia, *Macoun;* Vancouver Island, *Macoun;*

Washington, *Brandegee;* Tulare co., California, *Coville.* The specimens distributed as *Fimbriaria tenella* in Canadian Hepaticæ no. 73 are of this species, at least in the sets in my herbarium and in the herbarium of Columbia College.

8. **Asterella echinella** (Gottsche), nom. nov.

Fimbriaria echinella Gottsche Mex. Leverm. 271. 1863.

Orizaba, Mexico, *Müller;* Texas, *C. Wright*, 1849. Clearly marked by the prominent papillæ on the upper surface of the ♀ receptacle.

This includes all the species which I have seen from the limits of our flora.

In Austin's Hep. Bor.-Am. *136 c*, the habitat of the species included under that number (*Fimbriaria elegans*) is given as "Texas and Cuba, *Wright.*" The specimens in my herbarium and those in the Gray herbarium are both accompanied by fragments of a *Selaginella* which to my knowledge does not occur in Texas. It is extremely probable that the specimens were collected in Cuba by Charles Wright, and that the reference to Texas was based on the specimens of the above named species which are in the Sullivant collection labeled "*Fimbriaria elegans.*" Now here we have a double error, for neither Wright's Texan specimens nor those distributed in the Hep. Bor.-Am. belong to the species to which they have been referred. The former are clearly *A. echinella*, and the latter are described later in this paper. This double error and the lack until recently of suitable material for comparison has made it impossible to co-ordinate our species from Mexico and the southwest. It is hoped that the present paper will assist in straightening out the tangle.

The genuine *Asterella elegans* has not to my knowledge been found within the limits of the United States but is to be looked for in the Sonoran region from western Texas to southern California as it is found on both sides of the continent at a little lower latitude. We append a description that it may be recognized if found. Other Mexican and West Indian species follow.

9. ASTERELLA ELEGANS (Spreng.) Trevis. Rend. R. Ist. Lomb. Sc. II. **7:** 10. 1874.

Fimbriaria elegans Spreng. Syst. Veg. 4: 235. 1828.

Gametophyte 0.5–1.5^{cm} long, 1–2^{mm} wide, thalloid, dark green above with a wide purplish crispy margin, dark purple beneath and much thickened at the midrib; ♀ branch 1–1.5^{cm}

high, purple, often paler above, pilose especially at the apex; receptacle convex with 2–4 involucres; inner involucres white or tinged with pink, 8–12-cleft, the divisions coherent at the apices. Sporophyte dark, sessile; spores dark purple or nearly black, with a reddish border, reticulate when immature, opaque at maturity, 100–135μ in diameter; elaters dark, almost opaque, slender, 2–3 times as long as the diameter of the spores, bispiral.

On the earth among mosses, Lower California, *Brandegee*, Orizaba, *Müller*, 1853. To this species I would also refer a specimen in my herbarium from San Luis Potosi, Mexico, *Schaffner*, though it lacks the purple border; also immature specimens collected at Cordoba, *Farlow*. This species also occurs in South America and Europe.

A form occurs in Cuba which has been referred to the preceding species but evidently deserves specific rank. It has already a specific name but may be more fully characterized as follows:

10. **Asterella Cubensis** (Lehm.), nom. nov.

Fimbriaria Cubanensis Lehm. in Ramon de la Sagra, Hist. fis. pol. y nat. de la Isla de Cuba 9: 489. *pl. 19. fig. 3.* 1845.
F. elegans, var. *Cubensis* G. L. N. Syn. Hep. 566. 1846.

Gametophyte 1.5–2.5^{cm} long, 1.5–2^{mm} wide, pale green, thalloid, simple or rarely once forked, plane above or rarely grooved near the base, the margins occasionally purple; greenish or sometimes purplish beneath with a prominent midrib and copious root hairs; ♀ branch 1^{cm} or more high, slender, purple, slightly hairy; receptacle globose-conic, tuberculate, with one or rarely two involucres beneath interspersed with a few slender hairs; inner involucre brownish white, 8–9 cleft, the divisions coherent at their apices. Sporophyte dark colored, sessile; spores brown or purplish brown, opaque, with a paler brown margin, 95–105μ in diameter; elaters dark brown, about twice as long as the diameter of the spores, bispiral.

On hillsides, growing among mosses, Matanzas, Cuba, *Underwood*, Feb. 1891. To this species I also refer the immature specimens distributed in Hepaticæ Cubenses Wrightianæ as *Fimbriaria elegans*.

11. **Asterella Palmeri** (Aust.), nom. nov.

Fimbriaria Palmeri Aust. Bull. Torr. Bot. Club 6: 47. 1875.

Guadeloupe Island, off Lower California, *Palmer*. This ap-

pears to be a good species though all the specimens I have seen have immature spores.

12. **Asterella Pringlei,** n. sp.

Gametophyte 1–1.5^{cm} long, 2–4^{mm} wide, bright green, fleshy, thalloid, closely adherent to the soil, depressed along the center, the margins thin, areolate-veiny, irregularly crenate-undulate, greenish below with a few slender whitish lanceolate scales, and numerous root hairs along the midrib; ♀ branch slender, 1–1.5^{cm} high, brownish, lighter above, naked throughout; receptacle subglobose, much wrinkled when dry, with one or two somewhat divergent involucres; inner involucre white, about 12-cleft, the divisions cohering at their apices. Sporophyte sessile, with large brown or almost black spores that are tetrahedral, 118–135μ in diameter, narrowly winged and covered with narrow reticulations; elaters about two and a half times as long as the diameter of the spores, with 2–3 spiral fibers.

Wet cliffs near Gaudalajara, Mexico, *Pringle* (Sept. 11 1890).

13. **Asterella Austini,** n. sp.

Gametophyte 1–2^{cm} long, 2–3 wide, thalloid, plane, thin, green above and beneath with here and there occasional spots of purple, with narrow brownish scales and more or less copious root-hairs near the midrib beneath; ♀ branch 1^{cm} or more high, brownish, sparingly pilose but the hairs becoming more abundant at the apex; receptacle somewhat tuberculate above with 1–3 more or less divergent involucres; inner involucre brownish or dirty white, about 8-cleft, the divisions coherent at their apices. Sporophyte a sessile yellowish capsule; spores yellow, 110–118μ in diameter, broadly winged and distinctly reticulated; elaters about twice as long as the diameter of the spores with two irregularly coiled spirals.

Cuba, *C. Wright.* Distributed by Austin as *Fimbriaria elegans* (Hep. Bor.-Am. *136 c*) which (as represented in my herbarium) forms the type of this species. The specimen of this number in the Gray Herbarium agrees with mine except that it lacks mature spores. The set in the Herbarium of Columbia College lacks this number. I should be pleased to have others who possess sets of Austin's exsiccatæ compare their specimens with the above statements.

14. **Asterella Wrightii,** n. sp.

Gametophyte 1–2^{cm} long, 2–3^{mm} wide, thalloid, deeply

grooved, slender, light green above with crispy or deeply undulate margins, deep purple beneath with abundant narrow purple scales which often extend beyond the apex; ♀ branch purple, rather stout, 1^{cm} or less high, pilose throughout, with usually a dense mass of tomentum beneath the involucres; receptacle somewhat tuberculate above, with 3–4 somewhat divergent involucres; inner involucre short, brownish or often purplish, 8-cleft, the divisions coherent at their apices. Sporophyte sessile, spores (dark yellow) and elaters much as in *A. Austini* to which it is evidently closely related.

Cuba, *C. Wright.* Distributed in Hepaticæ Cubenses Wrightianæ as *Fimbriaria tenella* to which it bears little resemblance.

There are certain data that can best be collected in the field that we much desire to add to our knowledge of the species of *Asterella.* These are the characters of the antheridia which develop at a different time from the ♀ branch; most herbarium specimens are collected when this is mature and leave the ♂ receptacles largely to be conjectured. The genus was formerly regarded as monoicous but it is certain that *A. Californica* is dioicous and possibly other species are. Another feature to be studied where growing material can be had in quantity is the development of the ♀ branch. In his studies on *A. Californica* Dr. Campbell writes me that he finds that it differs from the account of *Fimbriaria* as given by Leitgeb; instead of having one growing point and thus forming a single branch, this species has four distinct apices and thus corresponds to Leitgeb's division "Compositæ" of which *Marchantia* is the type. The Pacific coast is the peculiar home of the genus in America and it is hoped that light will be thrown on other species of this interesting genus by workers in that region.

AYTONIA appears to be the original orthography of the genus established by Forster (1776) which has been further christened *Rupinia* Linn. f. (1780), *Otiona* Corda (1829), *Plagiochasma* L. et L. (1832), *Sedgwickia* Bisch. (1835), *Antrocephalus* Lehm. (1838), and *Otionia* Mitten (1885).

Two species are known from our borders which represent two very distinct types of structure. In the first species named the epidermal cells form a compact palisade structure, the cells being fully twice as high as wide; the air cavities are small and the entire thallus is compact and adapted to an environ-

ment which includes a dry season. In the second species the air cavities are very extensive so that the shoot on drying becomes roughened, and the epidermal cells are isodiametric. So far as we have seen the Mexican species, they are of the first type.

15. AYTONIA WRIGHTII (Sulliv.) Undw. Bull. Ill. State Lab. Nat. Hist. 2: 43. 1884.

Texas, *C. Wright.* Known only from its original specimen.

16. AYTONIA ERYTHROSPERMA (Sulliv.) Undw. l. c. 43. 1884.

Rocky Mountains, *E. Hall;* Eagle Pass, British Columbia, *Macoun;* Almota, Washington, *Piper;* Lake Pend d'Oreille, Idaho, *Leiberg;* Montana: Sand Coulee, *Anderson*, Great Falls, *R. S. Williams;* California: Tulare co., *Coville*, Pasadena, *McClatchie.*

Four additional species are known from Mexico:

17. **Aytonia crenulata** (Gottsche), nom. nov.

Plagiochasma crenulatum Gottsche, De Mex. Leverm. 266. 1863.

Orizaba, Mexico, *Farlow!*

18. **Aytonia elongata** (L. et G.), nom. nov.

Plagiochasma elongatum L. et G. Syn. Hep. 513. 1847.—Gottsche, De Mex. Leverm. 265. 1863.

19. **Aytonia intermedia** (L. et G.), nom. nov.

Plagiochasma intermedium L. et G. Syn. Hep. 513. 1847.—Gottsche, De Mex. Leverm. 264. 1863.

Guadalajara, Mexico, *Pringle!* Guatemala, *J. Donnell Smith!*

20. **Aytonia Mexicana** (L. et G.), nom. nov.

Plagiochasma Mexicanum L. et G. Syn. Hep. 519. 1847.—Gottsche, De Mex. Leverm. 267. 1863.

Since the publication of my Descriptive Catalogue, a genus entirely new to America has been discovered in British Columbia by Mr. J. Macoun. It is the genus *Clevea*, generally distributed in the northern parts of the eastern hemisphere.

21. CLEVEA HYALINA (Somm.) Lindb.

Under rocks, Lake Agnes, alt. 7,000ft, *Macoun;* also reported by Berggren from Greenland. The specimens distributed in Canadian Hepaticæ no. 75 belong (in my set) to *Aytonia erythrosperma.*

CONOCEPHALUM[3] Wiggers, Prim. Fl. Hols. 82. 1780, appears to be the oldest available name for what was called *Conocephalus* by Necker (1790), and *Fegatella* by Raddi (1818), since the earliest name, *Hepatica* Micheli (1729), is excluded by the Code. Our only species is

22. **Conocephalum conicum** (L.), nom. nov.

Marchantia conica L. Sp. Pl. 1138. 1753.

Widely distributed from Tennessee to California and northward.

I have specimens from Newfoundland, New Brunswick, Maine, New Hampshire, Vermont, Massachusetts, Connecticut, New York, New Jersey, Delaware, Virginia, Tennessee, Ohio, Indiana, Illinois, Wisconsin, Minnesota, Missouri, Nebraska, Idaho, California, Washington, British Columbia, Ontario and Alaska.

23. CRYPTOMITRIUM TENERUM (Hook.) Aust.

Central California: Palo Alto, *Campbell;* San Bernardino, *Parish;* Pasadena, *McClatchie.* Also reported from Mexico by *Gottsche.* Hitherto this has been very rare but Prof. McClatchie has recently collected it in considerable abundance.

It becomes necessary to make another change for the genus which has always been known in America under the name of *Preissia.* CYATHOPHORA S. F. Gray (1821) appears to be the oldest name, though Lindberg rejected it because of the moss genus *Cyathophorum* Pal. de Beauv (1805). It is a little singular that both Lindberg and Schiffner adopted *Chomiocarpon* Corda over *Preissia* Corda, for while both have the same date of publication the latter has priority of place. There has been fully as much difficulty with the specific name and there has consequently arisen an extensive list of synonyms. This has been aggravated by the attempt in Europe to maintain the autoicous form as a distinct species from the dioicous form. There seems to be no further reason for maintaining this distinction. If we have one species it will be known as

24. CYATHOPHORA QUADRATA (Scop.) Trevis Mem. R. Ist. Lomb. di Sci. Lett. III. **4**: 438. 1877.

[3] By typographical error this was printed *Cynocephalum,* which form was adopted by Lindberg before he took up the Michelian name *Hepatica.* Schiffner (in Engler-Prantl I[3]: 34. 1893), makes the singular error of citing *Conocephalus* Neck. with the date *1759.* Necker's *Elementa Botanica* was printed in 1790 and this genus is numbered 1759 in the third volume (p. 344)!

Marchantia quadrata Scop. Fl. carn. 2: 355. 1772. [ed. 2].
Marchantia hemisphaerica Auct. div. non L. Sp. Pl. 1138. 1753.
Marchantia commutata Lindenb. Syn. Hep. Europ. 101. 1829.

Widely distributed from New Jersey to Idaho and northward to Alaska and Greenland. I have specimens from Newfoundland, New Brunswick, Maine, New Hampshire, Vermont, Massachusetts, New York, New Jersey, Michigan, Wisconsin, Minnesota, Idaho, Ontario, British Columbia and Alaska.

25. **Cyathophora Mexicana** (Steph.), nom. nov.

Preissia Mexicana Steph. Hedw. 22: 49. 1883.

Mexico.

26. DUMORTIERA HIRSUTA (Swz.) R.Bl. et N.

Easton, Pennsylvania, *Porter* (seemingly its northern limit); East Tennessee, *Ruth*, *Scoville;* North Carolina, *Sullivant;* Georgia, *Underwood;* South Carolina, *Ravenel;* Florida, *Underwood;* Alabama, *Mohr;* Missouri ?, *Shepard;* Arkansas, *Coville;* Mexico, *Pringle;* Cuba, *Wright;* St. Domingo, *Eggers;* Trinidad, *Fendler;* and generally distributed throughout tropical regions.

27. GRIMALDIA FRAGRANS (Balb.) Corda.

G. barbifrons Bisch.
G. sessilis Sulliv.

Connecticut, *Evans;* New York, *Peck;* New Jersey, *Austin;* Pennsylvania, *Porter;* Missouri, *Weller;* Wisconsin, *Cheney;* Minnesota, *Holzinger;* Texas, *Wright;* New Mexico, *Fendler;* also reported by Austin from Illinois and Iowa. Seemingly widely distributed but rarely collected and probably local.

28. GRIMALDIA CALIFORNICA Gottsche.

California: Yosemite Valley, *Bolander;* Pasadena, *McClatchie.*

29. GRIMALDIA RUPESTRIS (Nees) Lindenb.

Mt. Albert, Gaspe co., Quebec, *Allen;* Belleville, Ontario, *Macoun;* Springfield, Ohio, *Spence.* Austin also reported it from New York, and Prof. Peck writes me that the State Herbarium at Albany has it from three localities.

The last species is often regarded as generically distinct from the other Grimaldiæ. It has formerly been placed in the genus *Duvallia* Nees (1817) but as there is an earlier *Duvallia* Haworth (1812). Schiffner has erected a new genus *Neesiella*[4] for its reception.

[4] Engler-Prantl, Die natürl. Pflanzenf. 1[3]: 32. 1893.

30. LUNULARIA CRUCIATA (L.) Dumort. Comm. Bot. 116. 1822.

L. vulgaris Auct. plur.

Always sterile in greenhouses; probably widely distributed but I have specimens only from Massachusetts, New York, and California.

There are three species of *Marchantia* now reported from our limits:

31. MARCHANTIA DISJUNCTA Sulliv.

Claiborne, Alabama, *Sullivant* (the original locality); Fayetteville, Arkansas, *Harvey;* Fort Worth, Texas, *Thomson;* also Orizaba, Mexico, *Müller, Stone;* Cuba, *C. Wright;* Jamaica, *Wilson.*

32. MARCHANTIA OREGONENSIS Steph. Bot. Centralb. **45:** 203. 1891.—Hedwigia **32:** 399. 1893.

Mt. Hood, Oregon, *Röll.* I am indebted to Herr Stephani for an original specimen of this species.

33. MARCHANTIA POLYMORPHA L.

Almost universally distributed throughout our borders as in all parts of the world. It appears to be more abundant in limestone regions but is by no means confined to them. We have specimens from Labrador, Newfoundland, N. S., Me., Mass., Ct., N. Y., Va., Tenn., Ind., Ill., Minn., Neb., Col., Ariz., Calif., Ore., Wash., Idaho, Mon., Br. Col., and Alaska.

A number of additional species are found south of our limits; so far as specimens exist in my collection I append a mark of exclamation.

34. MARCHANTIA CARTILAGINEA L. et L.

St. Vincent.

35. MARCHANTIA CHENOPODA L.

Orizaba, Mexico, *Stone!* Guatemala, *J. Donnell Smith!* Cuba, *C. Wright!* Martinique, *Husnot!* Also Porto Rico, Jamaica and Guadeloupe.

36. MARCHANTIA DOMINGENSIS L. et L.

Cuba, *C. Wright!* Also St. Domingo and Martinique.

37. MARCHANTIA INFLEXA M. et N.

St. Domingo; Martinique.

38. MARCHANTIA LINEARIS L. et L.

Cuba, *C. Wright!* Guatemala, *Watson!* Also St. Domingo, Guadeloupe, Martinique, St. Vincent, St. Christopher.

39. MARCHANTIA PAPILLATA Raddi.
Martinique.

40. MARCHANTIA THOLOPHORA Bisch.
Cordoba, Mexico, *Farlow!*

The transfer of the name *Asterella* to *Fimbriaria* has already been stated above. It is only worth noting that Raddi's name, originally *Rebouillia*, was amended by Nees in 1846 to its correct form *Reboulia;* the only species is

41. REBOULIA HEMISPHÆRICA (L.) Raddi.
Asterella hemisphærica Pal. de Beauv.

Widely distributed from Massachusetts and Ohio westward to British Columbia and southward to Mexico. We have specimens from Massachusetts, New York, New Jersey, Virginia, Georgia, Ohio, Indiana, Illinois, Wisconsin, Minnesota, British Columbia, Nebraska, Missouri, Arkansas, Louisiana, Texas, New Mexico, Arizona, California, and Lower California.

In *Die natürlichen Pflanzenfamilien*, Schiffner throws doubt upon the occurrence of *Sauteria* in America. The solitary specimen of our only species of this genus (a sterile one) was carefully reviewed, as the determination of sterile material has been found to be rather uncertain. This examination reveals the undoubted thallus structure of *Sauteria*, together with the peculiar stellate stomata which are caused by the thickening of the radial walls of the cells bounding the stoma. The air cavities in the shoot are also different from any other of our genera; they are large and deep and extend in a radiating series from the midrib outward. The original specimen is, I suppose, in the Austin collection. So far as I know it has been collected but once since.

42. SAUTERIA LIMBATA Aust.
Tulare Co., California, *Coville.*

The next genus shares with *Marchantia* the honor of being the only ones recognized in Linnaeus' Species Plantarum.

43. TARGIONIA HYPOPHYLLA L.
Vancouver Island, *Macoun;* California throughout, *Parish, McClatchie, Coville, Howe, Underwood.*

Two other species are found in Mexico:

44. TARGIONIA CONVOLUTA L. et G.
Oajaca.

45. TARGIONIA MEXICANA L. et G.
Jalapa.

The above represents all that is known of the distribution of the most conspicuous and most generally recognized forms of hepatics in North America. It will clearly be seen that there is still much to do, particularly in the west, southwest and south to determine with more definiteness the range of most of our species. Particularly is the state of Texas an excellent field for the enlargement of our knowledge concerning distribution. The fact that several species have not been recollected since Charles Wright explored that region in 1849 does not speak well for field work in that commonwealth.

Greencastle, Indiana.

The flora of Mt. Mansfield.

W. W. EGGLESTON.

Mt. Mansfield is on the western branch of the Green mountain "Y" about twenty miles to the northeast of Burlington. It is a long range of four peaks separated from Sterling mountain on the northeast by Smuggler's Notch, a narrow pass about three miles long, enclosed by tremendous cliffs. Looking from the east or west the Mansfield peaks present an excellent profile of the human face, for one sees distinctly marked the forehead, nose, lips and chin.

Mansfield is the second peak of the Green mountain range, the Chin having an elevation of 4,329 feet (Killington 4,380 feet); but as far as alpine botanizing is concerned it completely overshadows them all, even far famed Willoughby, for there have been but two plants (*Sisymbrium humile* and *Aster polyphyllus*) found at Willoughby not duplicated at Mansfield; while Mansfield has thirty and more not found at Willoughby. The early botanical history of the mountain principally clusters around the two alpine peaks, the Nose and the Chin, although Pursh, the first botanist of whom we have an account as visiting the mountain, found *Aspidium aculeatum Braunii* for the first time, in the base of Smuggler's Notch, on his trip through the New England mountains in 1807. In July or August, 1829, Dr. J. W. Robbins on his second trip through Vermont visited Mansfield and found a number of alpine plants. In 1839 it was visited by Edward Tuckerman and W. F. Macrae, and a few years later by Prof. Jos. Torrey and Prof. Wood, but it remained for Mr. C. G. Pringle to find some of the rarer plants on the peaks and to discover the wonderful alpine gardens in Smuggler's Notch.

His researches were commenced in the early '70's and were the means of adding several species to the flora of the eastern United States, as well as new stations for many plants found before only at Willoughby or the White mountains.

Since Pringle commenced his discoveries, Smuggler's Notch has been visited by several of our good botanists, including Dr. Morong, Ezra Brainerd, the Faxons, F. H. Horsford, G. H. Perkins, J. A. Bates, A. J. Grout and others.

To Dr. Morong we owe the discovery on the Sterling side of the Notch of *Primula Mistassinica*, found there only by him. Although the mountain and Notch have been so thoroughly explored by Pringle and others there still remains opportunity for new discoveries and plenty of work for an enthusiast in the relocation of old stations. For instance; Prof. Torrey found *Deschampsia atropurpurea*, specimens of which he has left in the university herbarium at Burlington, Vermont, but it has been found by no one else. Besides, the peaks are covered with ledges which have never been thoroughly explored, and to the south is a small pass, Underhill Notch, in which there are cliffs quite similar to Smuggler's Notch and which have been visited, I think, only by Pringle, Horsford and myself, and by no one for more than an hour or two. I went through this notch July 11th, 1894 and found new stations for *Aspidium fragrans*, *Woodsia glabella*, *Pellæa gracilis* and *Habenaria fimbriata*.

The complete flora of the mountain would probably comprise three or four hundred species about ninety of which are mountain plants, and about forty of these of especial interest. A few of these plants can be found both on the peaks and in the Notch. Among them are *Alnus viridis* DC., *Pyrus sambucifolia* C. & S., *Amelanchier oligocarpa* Roem., *Aspidium aculeatum Braunii* Koch, *Aspidium fragrans* Sw., and *Woodsia hyperborea* B. Br. and *glabella* R. Br. These, however, are exceptions, as the floras of the Notch and of the peaks show a wide difference and very little resemblance.

The peaks from the distance look like great mountain pastures, but after one has spent a day climbing the ledges he will conclude that they are goat pastures, if any.

The rocks are carpeted with *Arenaria Groenlandica* Sp. and *Vaccinium uliginosum* L., along with great quantities of *Vaccinium Vitis-Idæa* L. and *V. Pennsylvanicum angustifolium* Gray, *Carex rigida Bigelovii* Tuck. and *C. debilis Rudgei* Bailey, *Juncus trifidus* L., *Hierochloa alpina* R. & S., *Agrostis canina alpina* Oakes and *Lycopodium Selago* L. The sphagnum bogs with which the summits are dotted are filled with *Empetrum nigrum* L., *Vaccinium Oxycoccus* L., *Carex Magellanica* Lam. and *C. pauciflora* Lightf. Among the more local or rarer plants are *Prenanthes Boottii* Gray and *Diapensia Lapponica* L., found upon the bleak exposed summits; *Vaccinium cæspitosum* Mx. found in less exposed places;

Polygonum viviparum L. in the dry cold clefts; *Viburnum pauciflorum* Pyl., *Carex Michauxiana* Bœckl. and *Salix phylicifolia* L. in moist alpine ravines; *Salix Uva-ursi* Pursh, *S. balsamifera* Barrett, and *Betula papyrifera minor* Tuck. among the alpine rocks; and *Comandra livida*, Rich., a shy, rare habitant of sphagnum, evergreen-shaded bogs; but the greatest surprise in your plant discoveries on the peak is to find *Rumex Patientia* L., though this is one of the products of civilization found near the Summit House.

From the base of the Notch one is as badly deceived as by the peaks, for the cliffs look like pastures, only fresher and greener; but beware of the Smuggler's Notch pastures unless you enjoy dangerous cliff climbing, for when, after over a thousand foot climb you reach the pastures, they prove to be cliffs of the worst kind, covered with *Alnus viridis* DC. and *Scirpus caespitosus* L., the ladder and anchor of the Notch.

Upon reaching this altitude you can commence your successful work, for here in these massive cliffs is the place where Pringle made most of his discoveries. Probably the first plant you will notice will be *Saxifraga aizoides* L., along the little rivulets; higher up in the moist places, *Saxifraga oppositifolia* L., and in the moist, more exposed cliffs, *Saxifraga Aizoon* Jacq.; in the rich bottoms and sides of the ravines, *Astragalus Robbinsii* Gray, long mistaken for *A. alpinus* L., *Hedysarum boreale* Nutt., *Castilleia pallida septentrionalis* Gray, and *Erigeron hyssopifolius* Mx.; higher up in more exposed places *Artemisia Canadensis* Mx.; in the lower cliffs *Solidago Virgaurea Randii* Porter; near the top of the cliffs, *Solidago Virgaurea monticola* Porter, with a perplexing gradation between them everywhere; in the moist, cold cliffs, *Aster Novi-Belgii* L., *Calamagrostis stricta* Trin., *Carex scirpoidea* Mx., and *Conioselinum Canadense* T. & G. If you come upon a bit of cliff which is rotten and slimy from the dripping water, there you will find *Pinguicula vulgaris* L. Striking out from the ravines into the main cliffs, you will find on the wet, mossy, shaded ledges, *Woodsia glabella* R. Br.; in the moist, deeply shaded clefts, *Asplenium viride* Hud.; on the moist, shaded cliffs, *Pellæa gracilis* Hook.; and lucky is the botanist who, on dry, exposed cliffs finds the *Woodsia hyperborea* R. Br., or the *Aspidium fragrans* Sw. A peculiarity of the latter is that it always grows in dry clefts, sheltered from the rain. One of the rarest of the Smuggler's

Notch plants is *Draba incana* L.; C. G. Pringle says, "I once found a patch that I could have covered with my hat." I found a similar patch in 1893. Before this Willoughby was the only eastern station. The variety *arabisans* Watson is rather common in the moist cliffs. Another great variety is *Arenaria verna hirta* Watson, of which Pringle only found a small patch. This grows in the coldest alpine localities, in moist, gravelly soil, where also you will probably find *Gentiana Amarella acuta* Hook. f., *Luzula spicata* Des., and *Festuca ovina brevifolia* (new to Gray's Manual), L., plants equally rare. You may also find *Carex atrata ovata* Boott.; in the base of the Notch, the type station for *Aspidium aculeatum Braunii* Koch, one can also find *Pyrola minor* L.

The pleasure of the mountain climb is enhanced by the marvelously beautiful views, as well as by the feeling that one may collect, among these wild heights, plants which many others can know only from the dried specimens.

Rutland, Vermont.

BRIEFER ARTICLES.

The origin of the sexual organs of the Pteridophyta.—One of the greatest difficulties encountered in attempting to determine the homologies existing between bryophytes and pteridophytes has been the apparently radical differences in the structure of the sexual organs, especially the archegonium. The latter in all pteridophytes is remarkably constant in structure and always has the venter completely immersed and the neck composed of four rows of cells. In the bryophytes the venter is usually free, and the neck composed of six (sometimes five) rows of cells. These differences are especially noticeable when the leptosporangiate ferns are compared with the bryophytes, and so long as the former were regarded as primitive forms it made all attempts to connect them with any group of bryophytes seem hopeless.

When, however, the eusporangiate pteridophytes are examined, it is seen that they show certain points of resemblance in the structure of the sexual organs to one order of the Hepaticæ, the Anthoceroteæ, which has long been admitted to have the greatest affinity to the pteridophytes in the structure of the sporogonium. An examination of several members of this order in connection with the study of the development of *Marattia*, one of the eusporangiate ferns, led the writer to venture on a possible explanation of the origin of the archegonium of the latter from forms resembling the Anthoceroteæ. A further examination of other eusporangiate ferns, as well as *Equisetum* and the Lycopodineæ, makes it seem likely that the statements made with reference to *Marattia* are applicable to all pteridophytes, and that homologies in the antheridium of the eusporangiate pteridophytes and Anthoceroteæ can also be assumed with much probability.

In all bryophytes there are formed in the archegonium mother-cell three nearly vertical walls which intersect so as to enclose an axial cell from which are formed the egg and canal-cells, as well as a terminal cell, the cover cell. This latter in the Hepaticæ always divides by cross-walls into four cells which may occasionally undergo one or two further divisions. The axial row of cells is surrounded by three peripheral cells, which divide usually once by a vertical wall. Sometimes one of these fails to divide so that there are but five in all. These six (or five) cells are the initials for the corresponding rows of cells in the neck of the mature archegonium.

One group, the Anthoceroteæ, as is well known, differs very much in the appearance of the archegonium from the other Hepaticæ. Instead of projecting above the thallus it is completely sunk in it, and the limits of the neck cells are extremely obscure, while only the cover cells of the neck, or the uppermost cells of the axial row are free. A comparison of the earlier stages with the corresponding ones of the pteridophytes shows a striking resemblance, and renders the conclusion irresistible that the so-called mother cell of the archegonium of the latter is really homologous only with the axial row of cells of the bryophytic archegonium. It is equally evident that the four-rowed neck of the pteridophytic archegonium is a development of the four cap cells of the liverwort archegonium and cannot be properly compared to the six rows of neck cells in the latter. These are no longer clearly discernible but are more or less completely suppressed as in *Anthoceros*. As might be expected the departure from the bryophytic type is least marked in the Eusporangiatæ which in other respects come nearer to the Hepaticæ.

The Anthoceroteæ differ from all the other bryophytes in having the antheridium of endogenous origin. The antheridium (or antheridia) is covered by two layers of cells and the cavity within which it lies is completely closed from the first. The antheridial cell may give rise to a single antheridium, or more commonly, to a group of antheridia varying much in number even in the same species.

A study of the earlier stages, as was the case with the archegonium, shows very significant resemblances to the corresponding stages of the eusporangiate pteridophytes, and at once suggests that by a suppression of the wall and stalk of the antheridium of some form with a single antheridium, the type found in all the eusporangiate pteridophytes may have been at once formed. In the latter, the cell which in the Anthoceroteæ gives rise to the outer wall of the cavity containing the antheridia becomes at once the outer wall of the antheridium itself, while the inner one develops directly the mass of sperm cells. It is to be noted that this wall is double in some of the eusporangiate ferns, while in those that approach the Leptosporangiatæ it is single, and not infrequently projects somewhat so that the antheridium approaches the free condition found in normal Leptosporangiatæ. The greatest difficulty that remains is the origin of the multi-ciliate spermatozoids of the Filicineæ and Equisetineæ, to which, as yet, there is absolutely no clue.

In conclusion then, it seems probable that the origin of the pteridophytes is to be looked for from forms which, like *Anthoceros*, had the sexual organs completely submersed, and that the elongated archego-

nium neck and projecting antheridia of the Leptosporangiatæ are secondary developments.—DOUGLAS HOUGHTON CAMPBELL, *Berlin, Germany.*

Botanical notes (WITH PLATE VIII). — I. *The spreading of raspberry bushes by a system of natural "layering." Rubus occidentalis.*—A few observations, apparently not hitherto recorded, gave rise to the following more complete account of a process, the more general facts of which were already well known. The internodes formed by the raspberry in later summer are considerably longer than those produced earlier in the season, and bear but few prickles. This later growth becomes recurved and seeks the ground, the newer internodes being very long. After the stem has developed to a certain length in this downward direction, the newer internodes are very rapidly shortened, and the prickles become very numerous as compared with their frequency elsewhere on the stem. It was very interesting to see that when the plant grew on the sides of cliffs this shortening of internodes took place, even when the ground had not been reached, and when the growing ends of the descending branches were fully illuminated by the sun. The habit of terminating the branches at a certain length by means of the shortened internodes covered with prickles seems to have become so strong that the branches go through the process even where, owing to their growth on the side of cliffs, the normal conditions, which must have given origin to this habit—the shade and dampness formed by leaves along the ground, and the presence of loose earth into which the branches could penetrate—do not exist. The prickles towards the tips of the branches are strongly curved backwards, in decided contrast to the ordinary prickles of the plant which are fairly straight, and are placed nearly at right angles to the stem. On reaching the ground the shortened internodes curve forwards and enter it obliquely. The recurved prickles prevent the tips which are just starting root from being readily torn out of the ground, catching hold of the underbrush and weeds among which they have rooted, and hooking into the ground itself.

As the joints began to lengthen during summer, the leaves grew smaller, and by the time the newer internodes were strongly shortened, preparatory to rooting, the leaves were reduced to small scales, subtending small scaly buds. Indeed, this reduction to scales takes place even in the open air, before the ground has been reached, but is universal on the rooting part of the stem.

Towards the tip of the branches, among the shortened internodes, the stem sends out rootlets. These do not come out at any point on the stem, but occur in two pairs, at each node, just below the base of

the scales representing the leaves at this point, as shown in the figure (figs. 6, *c*, *b*, *a*). It was observed that these rootlets began to grow as soon as the branches reached the shade, but often before they touched the ground. At the very tip of the descending branches, where the internodes were the most shortened, all of the nodes developed roots, and in case these reached the earth the tips of the branches were soon rooted fast, and that leverage was secured which enabled the growing tips to penetrate the soil.

Soon after securing a firm hold in the soil, the tip turns rapidly upwards and forms a scaly winter bud. About four to eight inches behind the rooting end of the branch, the stem is usually very brittle, breaking readily when cattle or other large animals pass through the raspberry bushes, thus giving rise to independent plants.

II. *Notes on superposed buds and leaf scars.* 1. *Rubus villosus.*—The blackberry presents excellent cases of superposed buds, the upper being the older and stronger. Three are quite common. The common raspberry also shows superposed buds.

2. *Cephalanthus occidentalis.* In the button-bush, the tips of almost all branches were terminated by inflorescences, a part of which had never developed their flowers. The few tips not thus terminated showed shriveled up leaves and ends of branches, dying back before the arrival of frost. The general growth of the stem is therefore sympodial. The bush has commonly two or three superposed buds in the axils of the leaves. In the autumn the tip of the upper bud is often not visible, but its position is indicated by a low protuberance where the tip of the bud presses up the epidermis of the bark (figs. 1, *a*, *b*). When the bud penetrates the epidermis, it appears only as a very tiny point. The lower one or two buds are not visible usually on the exterior of the bark at this time of the year, being hidden beneath the leaf scar. The fibrovascular bundles form a semi-lunate figure in the scar, entering the same obliquely and usually leaving a vertical median partition above; the general appearance of the scar is, however, quite variable (figs. 1, *c*–*g*). The leaves often occur in whorls of three. The pith is lightly tinged with brown.

3. *Ilex verticillata* (figs. 2, *a*–*c*). Three or four buds, and consequently as many leaves, are clustered around the larger terminal bud of the branch. The leaves with short and rather few serrations are arranged on the two-fifths phyllotaxy. The berries are bright red, several seeded, and occur in a sort of raceme. The leaf scar with a raised semi-circular fascicle of fibrovascular cells entering the scar obliquely, are characteristic. Occasionally superposed buds are observed.

4. *Euonymus atropurpureus.*—Branches round, greenish tinged with

brown; pith white, tinged with green. Fibrovascular bundle forms a semi-circular marking on the leaf scar (figs. 3, *a*, *b*). The scaly bud and the opposite leaves also serve to distinguish this shrub. It forms a terminal bud.

5. *Magnolia Umbrella.*—The buds are covered with close villous hairs, and short hairs are also found at the tips of the branches. In the leaf scars the fibrovascular bundles appear as dots, arranged in two series, often confused and not readily distinguished in case the leaf scar is narrow (figs. 4, *a*, *b*). The exterior set of dots is the larger. In the scaly winter buds, the flowers in October show petals 7^{mm} long; the sepals are very distinct; the stamens are 2.5^{mm} long; the styles are very distinctly visible. The fruiting pedicel includes a node bearing occasionally a leaf (fig. 4 *c*), but usually only a sheathing scale, morphologically the sheathing petiole (fig. 4 *d*). The bark is greenish; tinged with brown. The characteristic sympodial growth of a large part of the branch is due to the abundant flowering tips, which later fall off. Sometimes two seeds occur in the cell (fig. 4 *e*).

6. *Liriodendron Tulipifera.*—In the leaf scar the outer series of fibrovascular bundles appears as five dots of larger size, arranged at approximately equal distances apart (figs. 5 *a*, *b*, *c*). The inner set of fibrovascular bundles varies in number and size. The pith is solid, and is composed of portions with large cells, separated by cross-portions composed of finer cells.—AUGUST F. FOERSTE, *Dayton, O.*

Tillæa simplex.—The re-discovery of Dr. Gray's shortia and of Audubon's Florida lily are familiar stories to botanists; other plants too, belong in the list, though not lost for so long; *Potamogeton Niagarensis*, for instance, detected by no one after its discovery by Professor Tuckerman, till the late Dr. Morong found it again in the same waters.

I write to put on record that after a lapse of sixty-five years *Tillæa simplex* Nutt. has come to light once more in Nantucket, Mass., where Oakes found it in 1829. It has been remembered and sought for in the course of these years, by diligent and ambitious collectors, natives of the island and visitors, as they had opportunity, and Mrs. Mabel F. Robinson of Elizabeth, N. J., is at last the fortunate discoverer. We shall never know where Oakes collected his plants as he said nothing more than "on the dried borders of small ponds," but as that most accurate botanist used "pond" in the plural number, we hope that new localities may yet be found for this rare little thing, of which only the gigantic specimens reach two inches in height.

Mrs. Robinson spends her summers in Nantucket with her family, and her interest in the island flora has led to this fine discovery.

And while writing I will mention that two species of *Picris* still rare in America, have in their travels reached this place; *P. hieracioides* and *P. echioides* have both been found this last season within our city limits, and also *Alyssum incanum* has appeared for the first time. *Azolla Caroliniana* has surprised us too, in our largest park, but as the pond which it covers with its fronds is full of lotus plants (*Nelumbo*), it is pretty certain that it came in with their roots. It shows that it is not quite at home in our northern waters by being of slender growth and producing no fruit.—MARIA L. OWEN, *Springfield, Mass.*

Leucoplasts.—It may be of interest to some to know that first-class material for starch formers, showing all stages of the formation of starch grains, may be obtained from the petioles of *Musa Ensete*, the Abyssinian banana. The oblong horizontal diaphragms separating the large intercellular spaces of the petiole are composed of from two to six layers of parenchymatous cells. The superficial layers are stellate in form and contain no leucoplasts or very few, but usually a large number of beautiful crystals. The cells of the deeper layers generally contain a considerable number of comparatively large leucoplasts, either clustered about the nucleus or scattered throughout the cytoplasm. For study it is only necessary to remove the diaphragm with a scalpel, pocket knife, or other similar instrument, mount and treat with reagent to suit the occasion. The lower eight to twelve inches of the petiole furnishes the best material. The botanical department of the University of Wisconsin can furnish a limited amount of this material to institutions not having access to the growing banana plants, at the cost of transportation.—L. S. CHENEY, *University of Wisconsin, Madison.*

Formulæ for life histories.—By an oversight the signs following S in the second, third, and fourth formulae printed on page 31 of the January number were o (representing gametes) instead of O (representing spores). Readers should make the correction.—J. M. C.

EDITORIAL.

IN LOOKING somewhat carefully into the methods of botanical instruction prevalent in our colleges it seems to us that there is a dangerous tendency that demands consideration. We do not refer to those colleges in which botany receives but little attention, but to those in which there is an attempt to develop it in a full and modern way. In the recoil from the old time methods, the college has gone to the other extreme and seeks to become a place of research, a sort of undergraduate university. The teachers who are fit to teach have either just come from great botanical centers where research is in the very air, or they are intensely occupied with their own investigations. The consequence is that raw young men and women, after a year or two of the study of "types," are assigned original problems, and their uncertain results, with more or less revision on the part of the instructor, are published in some periodical or bulletin. These callow productions have come upon us in swarms and they are richer in annoyance than in information. We do not blame the young authors in the least, but we do blame instructors for encouraging poorly prepared students to undertake original investigation. The science of botany is an enormous thing, with a long history and a rapidly increasing volume, and a year or two of preparation cannot fit any one to conduct a creditable research in any part of it. The different departments of it are so interdependent that it needs long training to bring the perspective and the grasp that make any independent investigation profitable. To interpret, and to fit results upon the great body of accumulated knowledge is not within the capacity of an undergraduate. We are perfectly aware that many ambitious students desire a "problem" almost as soon as they enter the laboratory, but it should no more be granted to them than solid food to a sucking babe. We are pleading for a longer devotion to the elements of botany in all their wide range, a patient preparation, year after year, of a suitable background upon which individual work may presently be projected, an abolition of independent undergraduate investigation. If the instructor be carrying on investigations in which students may be of service it is profitable and inspiring to allow such service, but this is training, not original research. Those students are fortunate who are held back from precocious research and publication, and those are to be pitied who are spurred into doing that for which they are in no way prepared.

CURRENT LITERATURE.

A new laboratory guide.

Since in these days no teacher of botany finds any entirely satisfactory helps until he himself writes a text-book or laboratory guide, it is not to be wondered at that the schools of pharmacy feel the same needs. Although the new book from the laboratory of Professor Bastin[1] is announced for "colleges and other schools," it is evident that its chief purpose is to meet the needs of students of pharmacy who have no time to study botany as a science, but must be led directly to the essential structures of those plants with which their business will have to do. For such students the book will prove to be a very useful guide in laboratory work. From the college standpoint, however, the usefulness of the book will depend entirely upon the training of the teacher. For students well grounded in a general survey of the plant kingdom, and in the doctrines of modern morphology, the book will be a useful collateral aid in the study of flowering plants. We fear that the pendulum has swung too far from the older botany, and in our eagerness to show that phanerogams represent only one group of plants we are in danger of an almost equally lop-sided cultivation of the lower groups. The phanerogams are still with us, and deserve a more careful study than they often recive in the modern laboratory. Such studies as Professor Bastin indicates are extremely valuable at the end of an elementary course, when the morphology of phanerogams has been approached by way of the lower groups and their variously modified structures become proper objects of study. The general purpose of the book is commendable, and its usefulness has been indicated, but in our judgment its usefulness would have been much enhanced by making it consistent with the universally accepted views of morphology. These views are not any more recondite to a beginner than are the older ones, as we have had abundant opportunity to know. The plates, especially the flower dissections, are to be criticised from the teacher's standpoint as encouraging small and indistinct sketches, the most persistent fault of the beginner. As a matter of personal preference, perhaps, we think that laboratory guides should be small and inexpensive and "handy" books, in which the typographer's pride in paper and margins and binding is inappro-

[1] BASTIN, EDSON S.—Laboratory exercises in botany, designed for the use of colleges and other schools in which botany is taught by laboratory methods. 8vo. pp. 540, plates 87. Philadelphia, W. B. Saunders, 1895. $2.50.

priate. We would raise the question, also, as to the wisdom of the numerous "forms for study." It smacks too much of the swarm of schemes for "plant analysis," which seek to compel the student to observe and think within rigid lines. Our objection is the pedagogical one that the student cannot be compelled too early to cultivate the habit of independence. The criticisms offered are all of minor importance excepting the fundamental one concerning modern morphology, and we cannot but think that even pharmacists would be the better of breathing the air of the modern laboratory, even if they handled no other structures than those indicated.

Mosses of France.

The Muscologia Gallica[1] has been completed by the issue of part 14. We have from time to time commented upon this very useful work as it appeared. The fourteen parts have averaged over thirty-two pages of text and nine plates, and have been appearing at irregular intervals since 1884. It is greatly to be regretted that Mr. Husnot did not give us the date of publication of each part, and we hope he will supply this information in the *Revue Bryologique.* The keys accompanying each genus seem good, and are certainly useful; but the want of classification beyond the genera and suborders Acrocarpæ and Pleurocarpæ is unfortunate. The author certainly ought to have given the orders and families a place.

The genus Orthotrichum, treated by Venturi, and the § Harpidium of Hypnum, by Renauld, go far outside the limits of France, or even the *contrées voisines,* and contain much that applies to our own species. This is particularly the case with the latter, which is really a monograph of the group.

The high price of the book will somewhat limit its sale we fear, but its author, lithographer, and publisher in one deserves much credit for his enterprise and financial reward for his labor.

On geographical distribution.

Dr. C. Hart Merriam, in a recent address, distributed as a reprint from *Nat. Geog. Mag.* 6: 229, has given an account of the laws of temperature control of the geographic distribution of terrestrial animals and plants. Dr. Merriam for several years has been investigating, under the Department of Agriculture, the subject of geographic distribution, and the present address is an abstract of the principal results. It

[1] Husnot, Th.—Muscologia Gallica; descriptions et figures des mousses de France et des contrées voisines. Roy. 8vo. pp. 458. pl. 125. Cahan: published by the author. 1884–1894. 70 fr.

is remarked that the question is not one of spreading over all available areas, but how this tendency to spread has been checked. The circumpolar belts of distribution in the northern hemisphere are primarily three: boreal, austral, tropical. These have subdivisions of various rank, the austral, for example, having the transition, upper austral, lower austral subdivisions. The most remarkable case of overlapping is that found on the Pacific coast, where the 1,000 miles from southern California to Puget sound belongs to the transition zone, elsewhere narrow, in which boreal and austral forms freely mingle, and which must account for that wonderfully varied flora. The limitation of these life zones Dr. Merriam finds to be due to temperature as the great primary cause. The two fundamental laws worked out are formulated as follows: (1) the northward distribution of animals and plants is determined by the total quantity of heat, the sum of the effective temperatures (that is, those above the assumed minimum); (2) the southward distribution of boreal, transition, and upper austral species is determined by the mean temperature of the hottest part of the year. The application of these laws to the Pacific coast strip will serve both as an illustration and as an explanation of that remarkable region. The data at hand demonstrate: (1) that the temperature of the summer season is phenomenally low for the latitude and altitude, so low as to enable boreal types to push south to latitude 35°; (2) that the total quantity of heat for the entire season is phenomenally high for the latitude, so high as to enable austral types to push north to Puget sound. It should be said that the minimum temperature of 6°C. (43°F.), has been assumed as marking the inception of the period of physiological activity in plants and of reproductive activity among animals, and that the total quantity of heat is obtained by adding temperatures above this minimum. Some of the temperature limits made out are as follows: *boreal*, southern boundary, isotherm of 18°C. (64.°4F.), for the six hottest consecutive weeks; *transition*, northern boundary, isotherm with a sum of normal positive temperatures of 5,500°C. (10,000°F.), southern boundary, isotherm of 22°C. (71.°6F.) for the six hottest consecutive weeks; *upper austral*, northern boundary, isotherm with a sum of 6,400°C. (11,500°F.), southern boundary, isotherm of 26°C. (78.°8F.) for the six hottest consecutive weeks; *lower austral*, northern boundary, isotherm with a sum of 10,000°C. (18,000°F.); *tropical*, northern and southern boundaries marked by isotherm showing a sum of 14,400°C. (26,000°F.). The most prominent secondary cause affecting distribution is said to be humidity. Three colored maps of the United States show distribution of total quantity of heat, mean temperature of six hottest consecutive weeks, and life zones. The close resemblance of the maps is remarkable.

OPEN LETTERS.

Unfair criticism.

Two thoroughly bad kinds of criticism are prevalent in scientific literature and frequently enough crop out in American journals. One is the indiscriminate and fulsome praise of books and papers written by one's personal friends, or by official superiors, or by people with whom one wishes to curry favor. The other is the malicious detraction, or misrepresentation, or damning by faint praise of articles written by individuals personally disagreeable to the reviewer. The latter is carried to such an extent by some persons both in America and Europe that, if the reader is not personally acquainted with the subject-matter, he must find out the personal relations of reviewer to writer before deciding what weight to give the review. This is all wrong. It injures the writer, makes the reviewer ridiculous, and to a certain extent impedes the progress of science. A good rule is never to review the writings of one's avowed enemies or warm personal friends. The strict adherence to this rule would result in reviews of a much higher order. What botanical science in this country needs most of all is *honest* and *fearless* criticism from which personal likes and dislikes have been eliminated. Nothing else would so tend to repress the flood of foolish writings, and to stimulate good work.—ERWIN F. SMITH, *Washington, D. C.*

The editorial committee of "Science."

In an editorial note in the January issue of the BOTANICAL GAZETTE you criticise *Science* for having several editors for zoology and only one for botany. The Editorial Committee of *Science* is composed of those who took the most active part in the reorganization of the journal. It so happens that in zoology and in anthropology there are two representatives, whereas for equally important subjects, such as physics and botany, there is only one representative. We trust, however, that botany in all its departments will be fully represented in the contents of the journal.—J. MCK. CATTELL, *Columbia College, Jan. 26, 1895.*

NOTES AND NEWS.

THE EDITORSHIP of Pringsheim's *Jahrbücher für wissenschaftliche Botanik* has been taken by Professors Pfeffer and Strasburger.

MACMILLAN & Co. announce a rural science series to be edited by Prof. L. H. Bailey of Cornell University. The first number will appear shortly.

MEEHAN'S MONTHLY will add hereafter four pages to its monthly issue. The fine colored plates, executed by Prang & Co., will be continued, which alone are worth the subscription price.

APPLIED BOTANY takes on many forms. It is announced that a society composed of students of the American Brewing Academy of Chicago numbers 200 members. The society has the unique name, SACCHAROMYCES CEREVISIÆ.

THE BACTERIAL DISEASE of sugar beets, first described in 1892 by J. C. Arthur and Katherine E. Golden, has been detected in Germany by Paul Sorauer. It is considered a similar disease to "sereh," a destructive disease of sugar cane.

FAVORABLE RESULTS in spraying to prevent black knot of plum trees have deen obtained by Mr. E. G. Lodeman (*Garden and Forest* 7: 508). His work seems to show, however, that the life-history of the fungus still presents much that needs elucidating, or at least verifying.

ELLIS AND EVERHART have recently published in the Proceedings of the Philadelphia Academy of Sciences descriptions of 241 new species of fungi, distributed among the following orders: Hymenomycetes 10, Pyrenomycetes 71, Discomycetes 22, Sphæropsideæ 92, and Hyphomycetes 46.

AMERICAN BOTANISTS should not let the opportunity pass to secure sets of both European and North American mosses put up by Messrs. Renauld and Cardot of France, and distributed in this country through Mr. J. M. Holzinger of Winona, Minn. The price is moderate, and the specimens very desirable.

THE LAST NUMBER of *Agricultural Science*, which recently appeared, is given as June–September, 1894. It is mostly occupied with the proceedings of the Society for the Promotion of Agricultural Science. This journal, although an excellent one, and occupying a place not filled by any other, is evidently having a struggle to keep alive.

THE ACETIC ACID ORGANISM, heretofore known as Mycoderma aceti, has been separated by Hansen in a recent publication from the Carlsberg Laboratory into two forms, which are called Bacterium aceti and B. Pasteurianum. The former is colored yellow by iodine and the latter blue. The transfer to the genus Bacterium was suggested by Zopf.

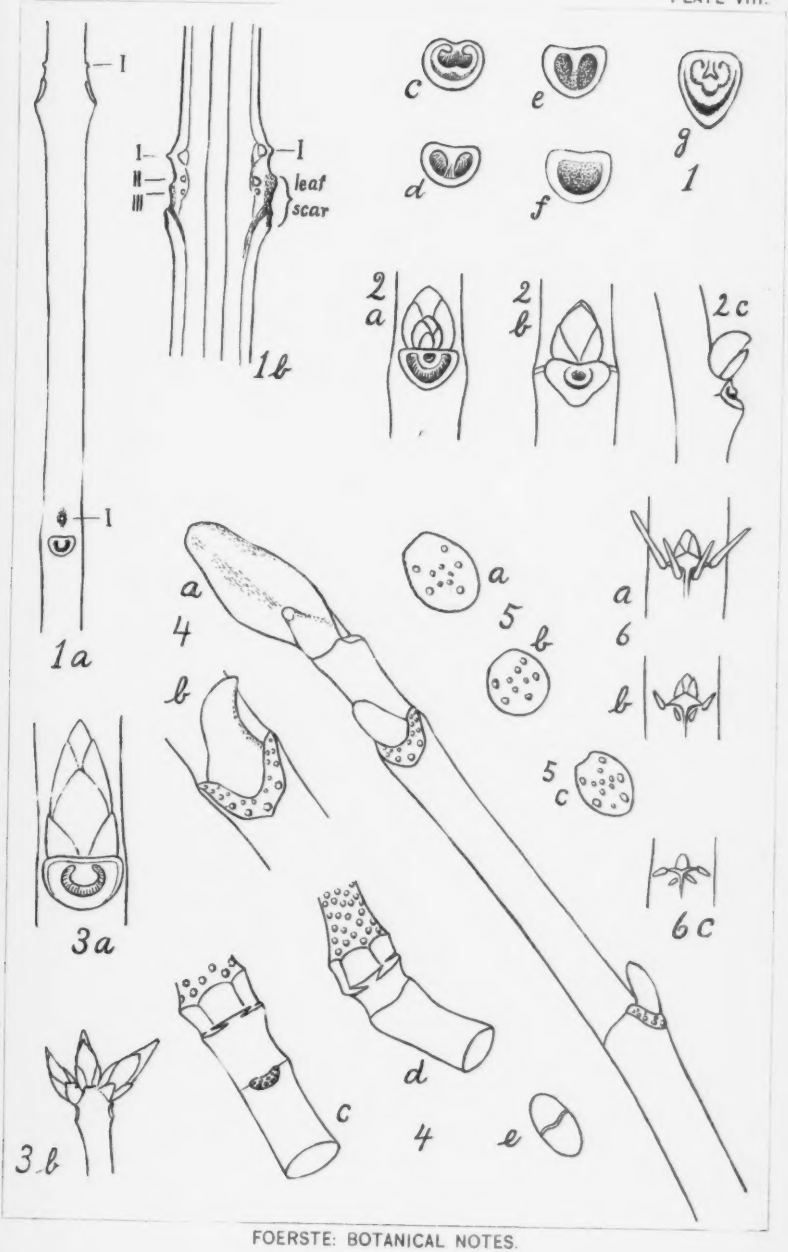
ADDITIONAL DESCRIPTIONS of species of Ravenelia are given in the last issue of Hedwigia (33: 367), by Dr. P. Dietel, to supplement his account of the genus in a former number (*l. c.* 22). The form on Acacia anisophylla and A. crassifolia from Mexico is separated under the name *R. Farlowiana*, n. sp., from *R. versatilis* (Pk.) on A. Greggii. Two other new species from Mexico are described, *R. Indigoferæ* on Indigofera Palmeri, and *R. Mexicana* on Calliandra. The *Uromyces deciduus* on Prosopis from California, described by Peck, is identified as the uredoform of *R. Holwayi* Diet., necessitating a change in the name to *R. decidua* (Pk.) Holw.

MR. J. REYNOLDS GREEN communicated to the British Association for the Advancement of Science at its last meeting the results of some experiments to determine the effect of light on diastase. He found that "light, whether solar or electric, exercises a destructive effect on diastase. The deleterious effect is confined to the rays of the violet end of the spectrum, the others being slightly favorable instead of destructive. . . . The destructive effect continues after exposure to light is discontinued, the exposed solution getting weaker and weaker till it had no diastatic property. The part of the solution kept in darkness maintained its diastatic power unimpaired for more than a month, by which time the exposed part, kept in darkness after its period of exposure, possessed no power to act upon starch."[1]

BULLETINS from the Experiment Stations of botanical interest, received since the last mention, are as follows: Grasses of Tennessee by F. L. Scribner (Tenn. 7: no. 1) is a very complete handbook of the grasses of the state, each species described and illustrated by an original drawing; Seed testing by Gerald McCarthy (N. C., no. 108), a rather extended treatise well illustrated; Millet by A. A. Crozier (Mich., no. 117) contains much information upon the history of the races and usage of the name, beside practical matters; Grafting of grapes by E. G. Lodeman (Cornell, no. 77) includes some account of the cell structure; Smuts of wheat, oats and barley by Luther Foster (Mont., no. 2); Spraying apple trees by Chas. A. Keffer (Mo., no. 27); and Some grape troubles of western New York by E. G. Lodeman (Cornell, no. 77) containing new observations, with good illustrations.

THE SEARCH for sexual organs in connection with the æcidia and spermogonia of the Uredineæ seems likely to prove futile, in spite of the supposed discovery of them by Massee. Careful work has been done by Rudolf Neumann (Hedwigia 33: 346), under the direction of Prof. Reess of Erlangen. He used alcoholic material, imbedded in paraffin, and cut with the microtome, and fresh material cut by hand. The examination of thousands of sections with oil immersion lens and otherwise, disclosed no trace of sexual organs. Both æcidia and spermogonia arise directly from the unchanged hyphæ. The forms examined grew upon Ficaria ranunculoides, Allium ursinum, Euphorbia Cyparissias, Falcaria Rivini, Sagittaria sagittifolia, Tragopogon pratensis and Berberis vulgaris. The hyphæ in the first two may be traced with ease at all stages, in the others with some difficulty, especially so in the last. The form on Ficaria was the one studied by Massee.

[1] Annals of Botany 8: 373. S 1894.



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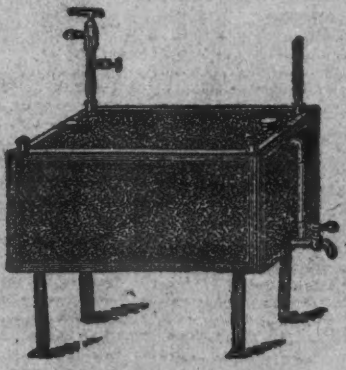

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